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EPILEPSY:

ITS SYMPTOMS, TREATMENT, AND RELATION TO OTHER CHRONIC CONVULSIVE DISEASES.

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EPILEPSY:

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AND RELATION TO

OTHER CHRONIC CONVULSIVE DISEASES.

BY

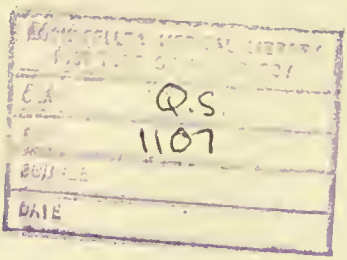
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TO

WALTER HAYLE WALSHE, M.D.,

PROFESSOR OF THE PRINCIPLES AND PRACTICE OF MEDICINE IN UNIVERSITY COLLEGE, LONDON,
PHYSICIAN TO UNIVERSITY COLLEGE HOSPITAL,
ETC. ETC. ETC.

My dear Dr. Walshe,

You were, so far as I know, the first in this country to expound, as you were unquestionably the ablest to illustrate, the application of the "Numerical Method" to pathology; and from the time that I left University College Hospital—where I had the high advantage of being your Clinical Assistant—until now, the work of collecting and arranging materials for this book has been lightened and made pleasurable to me by the thought of its bearing your name.

No one knows better than yourself the dangers of statistical inquiry; no one has like yourself avoided them. I might, therefore, hesitate to ask you to accept this work, did I not know that the friendship you have always shown me would lead you to accept the honest effort, and to pardon the inadvertent errors of its author.

I am, my dear Dr. Walshe,

Your still grateful Pupil and attached Friend,

J. RUSSELL REYNOLDS.

38, Grosvenor-street, Grosvenor-square,
September, 1861.

PREFACE.

Although it has been admitted, from the earliest periods of medical science, that "convulsions" might arise from different, and indeed opposite conditions of the physical system, it has been customary, and that even in modern times, when convulsions have assumed a particular form, and a "chronic" history, to denote them by one word—"Epilepsy." The increase of exact information has however rendered necessary the qualification of that term; and some not inconsiderable evils have arisen from the modes in which that qualification has been effected. These evils will be at once apparent if we trace the steps by which such terms as "renal epilepsy," "symptomatic epilepsy," and the like, have crept into daily usage.

As soon as pathological investigation had shown that no structural alterations were discoverable in the bodies of some who, during many years of their life-time, had been notoriously epileptic; and that in others, various lesions were to be found in the nervous centres, and in every organ of the body, a division of epilepsy was effected into "inorganic" or "functional," and "organic" or "structural." But such division was soon found inadequate; for the second category contained diseases as widely different from each other as tumour of the brain, and Bright's disease of the kidney, the relation between which lesions and the convulsion required further expression in nosology. The means employed for this purpose have been the words "symptomatic"

and "sympathetic;"—the former being applied to those cases in which epilepsy was believed to be dependent upon lesions of the nervous centre; the latter to those associated with disease of other organs;—while the words "idiopathic epilepsy" were used to denote those cases in which no structural change was proved to exist. Other terms were employed to convey similar ideas; and thus the expression "centric epilepsy,"—including both the idiopathic and symptomatic,—was used in opposition to that of "excentric epilepsy," by which sympathetic convulsions were intended. Among the cases, however, of so-called "sympathetic epilepsy" a number of most heterogeneous diseases were found assembled; and, in order to describe them, such words as "renal epilepsy," "gastric," "uterine," "saturnine," and other "epilepsies" were invented; expressing by their form the idea of that relation between cause and effect which their employer entertained, and equalling in number, and sometimes exceeding that of the organs of the body. Further, it was soon perceived that the mode in which convulsions are induced by a renal calculus differs widely from that in which Bright's disease produces a similar effect. In the one, the pelvis of the kidney is irritated by a foreign body; in the other the blood is poisoned by urea, or by the results of its decomposition. And since these two modes of causation were seen to be but types of two large groups of diseases,—any one of which might number convulsions among its symptoms,—the distinction between them was felt to require definite expression. The result has been that the former group, viz., that in which convulsion was traced to the irritation of some organ distant from the nervous system, still enjoyed the old names of sympathetic, or excentric epilepsy; while the latter group, viz., that in which a morbid change in the blood was held to induce the paroxysms, received the new name of "diathetic," or "toxæmic epilepsy." Thus, the "qualifications" of the word epilepsy have become numerous and confusing; and the application of that one name to many essentially distinct affections has been productive of grave practical evils.

The first evil is in regard of diagnosis and treatment, and is

this; that, although some individuals are quite free from such error, many rest content with assigning the name epilepsy to the malady under which a patient suffers; and they thus put a stop to all further inquiry into the case; regarding it either as hopelessly incurable, or as curable only by the chance employment of some so-called "specific" which might "suit the case." Thus, the treatment of a large group of very different diseases has been thrown back into the empirical condition from which all scientific practitioners have, for many years, sought to deliver the healing art.

A second evil has affected both pathology and nosology. The practice of retaining one name, epilepsy—however qualified by such terms as idiopathic, symptomatic, sympathetic, and the like—has thrown too much importance upon the similarity of forms of disease, and too little upon their points of essential difference. It has grouped together cases presenting resemblance in superficial or accidental features,—such as the form and order of convulsive movements,—although they have been so widely separated in important characters as are syphilitic meningitis, urinæmic convulsions from Bright's disease, the fits of dentition or dyspepsia, and the idiopathic malady which we term true, uncomplicated epilepsy. Such a method of constructing a nosology has inverted the true principle of classification; substituting the more important character for the less important; and doing this in circumstances where such error is most prejudicial to the science of pathology, and its practical application.

If there are cases, and it cannot be doubted that there are, in which nothing morbid can be discovered, either in structure or function, over and above the occurrence of certain paroxysms of convulsion; and if to these the name "epilepsy" is to be applied, as it has been for a long period in the history of medicine, then those cases which present convulsions, and other symptoms which are clearly traceable either to changes in the blood, or definite diseases of the nervous centres, or of other organs, should be denoted by some different name. The difference between them is one of essential character; and, instead of being

concealed by the use of terms implying a resemblance greater than that which exists, should be brought prominently forward as the basis both of study and of practice. To introduce into the region of thoracic diseases a nosology similar to that which has been current in regard of these affections of the nervous system would result in such mystification as the following: we should call chronic bronchitis, symptomatic asthma; the dyspnœa that arises in Bright's disease, from changes in the lung and blood, we should term renal asthma; the panting respiration of hysteria would be called sympathetic or uterine asthma; and other affections would receive equally inappropriate designations.

In the following work I have endeavoured to avoid the evil now pointed out, by employing the word epilepsy to denote only those cases in which no other disease was discoverable; and designating by other names, in more or less common usage, those cases of convulsion which depend upon recognised lesions, or disturbances of different organs of the body.

The disease described in this volume is, strictly speaking, idiopathic epilepsy; and I have here nothing to do with so-called symptomatic or sympathetic epilepsy, each of which will be examined in another work. It has appeared to me important to know first of all as much as can be known of the natural history of this idiopathic disease, the simplest of the convulsive affections, because existing by itself, *i. e.* apart from all other recognised pathological conditions, and I have therefore endeavoured to show what, and how much it may produce in the way of symptoms; how these symptoms are related to each other, and to the causative conditions of disease. Not knowing the course and distinct features of the simple, idiopathic affection, we should be unable to say how much, in a given case, was due to the functional, how much to the structural condition of special organs, and how much to the state of the general system; but, knowing the history of true uncomplicated epilepsy, we shall be able to contrast therewith that of

convulsions attending upon diseases or lesions of the nervous centres, of the other organs of the body, and of the blood.

Regarding a chronic paroxysmal affection as one which, in some form or another, must exist during the intervals of attack, and of which the latter is but the occasional although characteristic expression; it is of importance to examine minutely the condition of the patient during the interparoxysmal period, in order to discover whether the morbid state, which underlies the convulsion, and is capable of developing that formidable series of phenomena, has other features than those of the paroxysm. The epileptics, therefore, which have been under my care, I have examined, during the intervals of their attacks, in regard of their mental state; their sensorial and emotional condition; their state in so far as motility is concerned; and also their condition in respect of general health.

The features of the attacks are then described in their several forms; and, under the head of Natural History, I have given information upon such points as the prevalence of epilepsy, its proportion to diseases generally, to affections of the nervous system, and to convulsive diseases. I have examined the causes of epilepsy, both the unavoidable and accidental; and have traced the relations between its several phenomena. By the latter process I have endeavoured to show in what way, and how far changes of mind, of motility, and of the general health, are related to one another; to the duration of the disease; to the nature of its cause; and to the frequency, severity, and form of the attacks. The consequences and complications of epilepsy are then considered, and its pathology investigated. I have then furnished the materials for its diagnosis, prognosis, and treatment; occasionally illustrating points of special interest by the introduction of cases. In the first chapter I have given, so far as it was necessary for my present purpose, an outline of the existing state of physiology and pathology as applied to the interpretation of diseases of the nervous system. I have occasionally quoted authorities for the sake of enforcing particular points; and a list has been furnished of the editions

of books, papers, &c., to which reference has been made: but it has not been my intention to supply a history of the development of either opinion or practice with regard to the disease in question; as such a proceeding would have occupied much space, which could be more profitably employed by the record of facts which have been observed by myself. An examination of the table of contents will, I think, render still more apparent the general plan and order of the book.

The method employed in almost the whole of this work has been "the numerical," and upon the application of this method to the investigation of disease I wish to make a few remarks. Statistical propositions represent only fractions of the truth which lies beyond them, and the whole of which cannot yet be expressed; they are of value, inasmuch as they tell us what fraction we have obtained. They are of especial use as a means of pointing out and correcting erroneous impressions; of indicating the direction in which true principles or laws may be discovered; and of so registering the facts we have observed, in regard of two or more groups of natural objects, that we may satisfactorily compare and contrast these, and become acquainted with their mutual relations.

If a general principle is enunciated, such as the prevalence of rainy weather after a wet St. Swithin's day, some belief in its correctness may become popular; and numberless individuals,—including the most weatherwise of the neighbourhood, and "the oldest inhabitant" of the town,—may so throw their learning and experience into the scale as to turn the balance in the direction of the generally-received belief. The young inquirer, who, from his few years of individual observation, is disposed to bring a verdict of "not proven" against the consequences of St. Swithin's tears, is either laughed to scorn, or "put down" as an insolent sceptic who would dare to question the wisdom of those sages who knew all about St. Swithin before the young would-be philosopher was born. But statistics may show, as they have recently done, that, at all events at Greenwich, a

proposition, the very opposite of that usually entertained, is true.* Similar demonstrations have occurred in the history of medicine, and I refer for illustration to that most masterly employment of the numerical method in the investigation by Dr. Walshe, of the hereditary character of phthisis, and of the laws of hæmoptysis.†

In the following work I have shown that some general principles enunciated with regard to epilepsy, not only have exceptions, but that these are more frequent than are the examples of their correctness; and that therefore those so-called "general principles" are demonstrably wrong. Further, the numerical method may be so employed as to show that a principle, antagonistic to that which is generally received, has greater claims to reception; and thus evidence of a positive character may be furnished against the adoption of the received opinion. In this manner statistics have been frequently employed in the course of the present researches upon epilepsy.

It often happens that a startling fact makes so strong an impression upon the mind of its observer, that he attaches to it an importance far greater than it deserves, and this to the depreciation of other and more common occurrences. For example, a certain "cause" has been seen followed by a particular disease; the relation has been carefully established, and the circumstances have been so forcibly impressed upon the mind that the observer is prone to look at other cases in the light of this one; and, as it often happens, when he cannot ascertain any facts in support of his favourite notion, to supply them from imagination or suspicion, and construe all that he does observe into a form which squares with his own theory. We have a natural repugnance to the admission of our own ignorance or error; it is more pleasant to suspect wilful concealment on the

* Nevertheless, it is interesting to observe,—in illustration of another use of the statistical method,—the great prevalence of rainy days at this particular period of the year. This fact, which had been frequently observed, is established by the numerical examination which, at the same time, explodes its popular but erroneous interpretation.

† British and Foreign Medico-Chirurgical Review, January, 1849.

part of a patient, or even some freak or *lusus naturæ*, than that our own beautiful generalisation is at fault; and hence, sometimes, we turn away from facts which speak against us, to luxuriate in the society of those which seem all made to our own order. Rejoicing in the thought that we are the "interpreters of Nature," we nevertheless wish that her utterances may be upon our side; and we are disposed not merely to convey, but to parody and convert her teaching. With all reverence to the great men who have built up the science of medicine, it must be admitted that many of their doctrines have had no firmer foundation than that which I have described, and that yet these doctrines have passed current in the minds of their followers for generations; they have been accepted without question, and acted upon without fear; and thus the trustworthy beliefs of the day are compounded with the false notions of tradition as well as with the hasty generalisations of the individual. Now, for the purpose of correcting these, or of showing their true value, when they have any, no method is more convincing than the numerical.

In the employment of statistics with the intention of indicating the direction in which true principles or laws may be discovered, we exhibit perhaps their highest use; but it must be remembered that numerical statements of per-centage and proportion, although they may be perfectly correct so far as they extend, are yet not of the nature of vital or pathological laws.* If it is said that fifty per cent. of the cases of a particular disease, such as epilepsy, present a special symptom, and that fifty per cent. do not, it is not to be regarded as a law of that disease that one half of its examples should differ from the other half. The proper conclusion is, either that the symptom in question, when present, was not essential to the fact of epilepsy, or that the cases from which it was absent were not true examples of that disease. Upon the one supposition, half the cases presented something more than epilepsy; upon the other, half the cases presented less. Either the symptom is

* See Facts and Laws of Life, an Introductory Lecture, by the Author.

a "complication" in fifty per cent., or fifty per cent. of the cases are "abortive," or imperfect. Yet, notwithstanding this constant result of the use of statistics in pathology, it is convenient to retain, as we do, many names—of more or less vague meaning and applicability—to denote diseases which we feel are as yet very inadequately described. It is always highly undesirable to change the names of things, and unless change is imperatively demanded it should be avoided; but the application of the numerical method to the study of disease must result, occasionally, in the disturbance of our nomenclature.

The names by which the greater number of diseases are known express either their *essential* or prominent symptoms; or some structural condition supposed to be *primary* to, or causative of the symptoms; or the general sum of *all* the morbid changes. Under these names, and therefore upon different principles, groups of cases are formed; but each case, in addition to that which it is necessary for it to possess in order to be placed in this or the other category, presents other phenomena than those implied in the name, and than those essential to its position in the group. That which is essential is no matter for statistics in the sense here intended; in every case of pneumonia there must be inflammation of the lung; but in every case of pneumonia there need not be pain in the chest: it is less common than is that symptom in pleuritis; and *how much* less common it may be highly important for us to know. The diagnosis among many allied diseases is often framed upon a consideration of the proportion borne to each other by symptoms which are, more or less, common to them all; and the diagnostic value of symptoms is in direct relation to the definiteness of our information about them. Such definiteness can only be gained by the numerical method.

The diagnosis of a case is, practically, the process by which, knowing some of its symptoms or phenomena, we infer the others; theoretically, it is the discovery of its primary or essential fact. It is the deductive application of pathology to the particular instance in question; the name we assign to the

malady under which an individual suffers carries with it certain pathological ideas, and conveys the case to its position in our nosological categories. But the examination of particular cases is the basis of all pathological science; observation of the phenomena of disease is the source whence our notions are derived; and hence the standard to which we must appeal for the confirmation or contradiction of our doctrines. Thus the classification we employ has its correctness put to the test at the very time that we make use of it; and to frame a satisfactory classification is one great object of natural science. In order that such classification should be absolutely perfect, our information should be co-extensive with the facts; and, until this point is reached, all systems are but temporary arrangements, which express only some portions of the truth of real natural affinity, and this by the formation of groups, the elements of which bear the greatest appreciable resemblance to one another.

It is not evident that any perfectly "natural system" of classification can exist: the only natural division which is established beyond dispute is that of the individual. Such terms as variety, species, genus, order, class, sub-kingdom, and kingdom, have an unfixed meaning, and a changing application. They are not only convenient, but necessary aids in the progress of scientific investigation; their construction and usefulness are proofs and measures of the development of scientific knowledge; they convey meanings which, for practical purposes, are well understood: but their true meaning cannot be regarded as established; for high authorities differ widely as to the essential ideas conveyed by such terms as variety and species; and enlarged observation renders it necessary that either individuals should change their places, or that features regarded as indicative of specific difference should be held as characteristic only of variety, and *vice versâ;* and lastly, that new nomenclature should sometimes be employed to convey accurately the truths we have ascertained.

The advantage of classification is the power of recognition

which it furnishes by the aid of certain features; the fault is that it cannot express all the features. The names by which we know things are sufficient for the former purpose; our information is insufficient for the latter. There is this hypothesis, moreover, underlying all our systems of classification; viz., that there exists between the individuals of a species, and between the species of a genus, some nearer, deeper, and more intimate relation than any which is apparent in petal, in organ, or in symptom; that in the ultimate essence—in that which makes the plant, animal, or disease just what it is, and no other—there is some resemblance to that of its congener, which may be witnessed to by external features, which determines the characters of those features, but which after all is not adequately expressed by them. For in one individual *this* character is absent, in a second *that;* and no one possesses all, and yet not more than all, the features proper to the group. There is an imaginary centre, an ideal type, around which all the members radiate, and from which they diverge. No two individuals are entirely alike; no two cases of what is called "the same disease" are precisely similar; and, on the other hand, no two natural objects are entirely different; they all possess some material or some properties in common. The same elementary substances, the same elemental forces, run through all Nature's works; their varied combinations produce the infinite variety of forms by which we are surrounded; and all our attempts to classify them result in the drawing of artificial lines, by which we may roughly separate from one another artificial groups, bring them into some relation with our laws of thought, study some of their characters, and compare them with those of other groups. We give names to the groups that we have formed; these names enable us to connote certain facts about them; and they convey to others, more or less accurately, the ideas we have formed of the relationship of their individual members: but names can neither register nor describe all the facts; and they fail to convey the whole of our ideas of the relation—which we can only obscurely see—between the objects they enable us to recognise;

for our knowledge is not in a position to allow of our assigning, with positive certainty, to the different objects that we see, the value of all the manifold materials, properties, and actions which they have in common.

But in this condition of our minds, and of their scientific information, no method is so useful as the numerical. It enables us to bring together those objects which present the largest number of features in common; to approximate the most nearly to a true valuation of particular characters,—those having the highest value which persist through the longest series of divergent elements;—to compare group with group; and to advance, by its means, to the separation from each other of those which agree in some few—they may be striking but incssential—qualities; and to detect the inner, most important, and most numerous relations among those which, in outer and conspicuous details, differ widely.

In the investigation of disease this method is of especial service. Minute observation, and its numerical analysis, compel us to rearrange some of our nomenclature, and in the case before us to remove from the group denominated epilepsy at least three forms of disease which have constantly passed under its name. Having accomplished this, we have a residue of cases presenting closer affinities than those which existed among the heterogeneous elements previously strung together; and the further examination of this group affords us some nearer approximation towards a knowledge of its natural history.

The value of a numerical result, in regard of pathology and therapeutics, is in proportion to the mutual proximity of the cases examined, and not simply to the number from which such result is derived. If our object is to know the natural history of convulsive diseases as a whole, we must of necessity embrace a vast number of cases; and some information gathered from such broad basis would possess great interest and utility; but, inasmuch as these diseases differ widely from one another, in their structural conditions, their phenomena beyond the convulsions, their influence upon social qualifications, upon

mind, upon life, and upon death, it is obvious that they must be regarded separately if we would learn the truth about them in these important relationships.

The discrepancies which occur between the statements of different authors,—writing with equal ability and with equal honesty,—are due to the fact that they, in reality, deal with different diseases. The group of convulsive cases examined by one may be composed mainly of distinct cerebral diseases, such for instance as are presented by the epileptics of a lunatic asylum; that examined by another may have no lunatics among its number, but may be made up of eccentric convulsions or of diathetic diseases chiefly; whereas that described by a third may consist principally of epileptics. It is obvious, therefore, that the statistical results obtained from these three groups must differ widely in regard of such points as mental condition, hereditary taint, &c. Taking chronic convulsive disease as the sole ground of association for a number of cases; and forming several groups, upon that simple principle, in different countries, towns, or even in the same town, were that possible, the probability is that no two groups would contain the same proportion of the several different forms of convulsive affection. Nay, it is certain that they would not do so unless every group was so large that it embraced within itself all forms and conditions of variation. Statistical results are uniform only when the numbers from which they are derived are thus extensive. Until that point is reached there is variety, and, as it would seem, discrepancy; and especially has this been the case with regard to the subject now considered, for with so vast a concourse of diseases as those which make up the convulsive, such point can scarcely be reached, the objects be minutely examined, and the results compared, in the lifetime of any individual. What is required, then, is division of labour and of subject; and if this division is carried out as nearly as it can be in accordance with nature, and carried out to the furthest point that we can pursue it, a comparatively small number of cases will furnish some valuable information. For some purposes

it is better to have the statistical examination of eighty cases as nearly as possible identical, than that of eight hundred cases differing widely.

In the following volume I have therefore analysed eighty-eight cases of simple and idiopathic epilepsy, this being the number of examples of that disease with regard to which I have been able to record accurate information. In them I could trace no evidence of any other affection, and to them I could apply no other name than epilepsy. The number, it may be said, is small, but the examples bear close resemblance to each other, and the result of their examination will, I think, be more valuable than if I had arranged in one large group for analysis all those cases of different chronic convulsive diseases—*i. e.* of so-called epilepsy—which have fallen under my observation and care.

If the principle which has guided me in applying the name epilepsy to them alone be held to be erroneous, it does not detract from the usefulness of these researches; for it is surely better that "idiopathic epilepsy" should be examined by itself, than that any conclusions with regard to its effects upon mind, upon motility, and upon the general health; or than that any statements as to the age of its onset, the frequency, form, or duration of its seizures, should be confounded by conclusions drawn from "symptomatic epilepsy," which includes every kind of lesion of the brain; and "sympathetic epilepsy," which includes diseases as numerous as the organs of the body, and as varied as the changes they may undergo.

Nothing, however, is more remote from my thought than that any of these results are final. Statistics do but deal with imperfect knowledge; they register so-called "exceptions," which are either ignorances or errors; and they also point out the direction in which truth yet concealed may be discovered: but the object of scientific investigation is, not to rest satisfied with this recognition of an exception, but to find out its cause; not to stop when we have gained only some glimpse of the position of truth, but to advance, as far as possible, to the

possession and appreciation of it all. Towards the realization of this end the numerical method may be our most trustworthy guide; but statistical results are not the end itself. The truth we seek is not to be expressed by per-centage, but by terms which are as absolute as truth itself; the so-called exceptions we meet with are to be explained as illustrations of a yet higher law; and the proportions with which at present we are compelled to deal are to be regarded but as parts of that which, hereafter, we may arrange into a perfect whole.

38, Grosvenor Street, Grosvenor Square.

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CHRONIC CONVULSIVE DISEASES.

CHAPTER I.

INTRODUCTION TO THE PATHOLOGY OF NERVOUS DISEASES.

"Der einheitliche Grund aller Erscheinungen, gesunder wie kranker, ist nur das Leben selbst, und eine von dem übrigen Leben abgelöste, neben ihm bestehende und für sich seiende Krankheit besteht nicht. Was wir Krankheit nennen, ist nur eine Abstraction, ein Begriff, womit wir gewisse Erscheinungscomplexe des Lebens aus der Summe der übrigen heraussondern, ohne dass in der Natur selbst eine solche Sonderung bestünde."—VIRCHOW.

It is not long since the pathology of diseases of the nervous system was in the rear of that established in regard of almost all other groups of organs. The phenomena of nervous disturbance were of such complication and variety, and the relations between structural and functional changes were so uncertain, and as it then appeared contradictory, that it seemed hopeless to look for any general principles to which they might be reduced. Now, however, it may be affirmed that diseases of the nervous system furnish a key to the interpretation of all others; for the very conditions giving rise to difficulties which seemed well-nigh insurmountable, have, by their investigation and solution, opened a way for the light to fall upon many distant and dark places of the science of Medicine. Careful study of diseases of the nervous system has shown that much, previously regarded as established truth, is demonstrably wrong; that the direct causes of symptoms are not those which have been supposed; that the lesions, to which pain, and spasms, paralysis, and the like have been referred, are but the remote

occasions of their production; and that there are certain portions of the nervous centres which mediate between almost all anatomical changes and the symptoms or phenomena of disease. Thus the conclusions arrived at, in removing much of the mystery from disorders of the brain and spinal cord, have contributed largely to a better understanding of those which affect all other organs in the body.

In order to apply pathological science in its present condition to the interpretation of convulsive affections, it is necessary to state, and I will do so as briefly as possible, the principles upon which that interpretation rests. By so doing, the terms employed will acquire a definite meaning, and will be helps rather than hindrances to our progress, as they have often been.

§ I. If we attempt to define what we mean by "disease," we shall, I think, be driven to say,—it is the sum-total of modifications of function and structure present at a given time. The words pneumonia and pleuritis refer to anatomical changes; asthma and epilepsy to functional conditions; phthisis and tuberculosis to some general modifications of nutrition; hooping-cough and writer's cramp, each to a special symptom; typhoid fever and urinæmia to poisoned blood; and there are other terms of which it would be rather difficult to say what they mean. It is evident then, that when we say a man's disease is pneumonia, or any one of the above pairs, that we use the term in a different sense from that in which we employ it when it is applied to either of the others.

By pneumonia, however, we mean more than an anatomical condition; by epilepsy we imply more than functional change; the terms phthisis, hooping-cough, and typhoid, convey more than changes in nutrition generally, special symptoms, or poisoned blood. Looked at from the side of life, disease means a group of altered functions, with their correlated changes in structure.

§ II. The measure of disease is the degree in which it hinders a man from performing any or all of the functions of manhood—physical, animal, intellectual, moral, domestic, social. Its importance bears direct relation to that of the kind of activity which it limits or prevents.

Looked at from the highest point of view, the hypochondriac

man, the hysteric woman, or the epileptic youth, are more diseased, although their organs may present no discoverable change, than are those whose brain, lungs, or limbs may be invaded or partially destroyed by tubercle, or cancer. In the former group, the individuals may be useless to society, a distress to their friends, and to themselves; in the latter, in spite of pain and weakness, they may be yet doing the work that is given them to do. Death is the final issue and triumph of disease, and the degree to which it is induced is the measure of the evil; but this is not to be gauged only by its relation to time. There may be a life-long death of all but mere physical existence; there often is intense life amidst rapid, torturing decay.* The measure of disease, then, is the degree to which it induces complete or partial death; the degree in which it perverts or limits life.

§ III. The classification of diseases has always been a difficult problem; the three elements upon which it is based are organ, function, and nature of morbid change; and sometimes one of these has had primary importance, and sometimes another; but all systems of arrangement have been, confessedly, more or less unsatisfactory, and diseases of the nervous system have been among the most unmanageable.

In a work which I published in 1855,† some reasons were given for preferring to classify diseases in such manner as to form groups presenting clinical resemblance, rather than local or pathological; and thus such terms as apoplectic diseases, convulsive diseases, and the like, were used to denote maladies presenting prominent symptoms in common, but differing, often very widely, in their anatomical relations.

It still seems to me that such an arrangement approximates the most closely to a "natural system;" and that, although fraught with many difficulties, it is yet open to fewer objections, at all events in the present state of science, than any other.

The man who has lost the use of his right arm is, practically speaking, more closely related to his neighbour who has met with the same misfortune, although from a different cause, than

* *Vide* "Facts and Laws of Life," an Introductory Lecture by the Author, p. 10.

† Diagnosis of Diseases of the Brain, Spinal Cord, Nerves, and their Appendages, p. 48.

he is to another who has been deprived of sight or speech by a lesion, locally and pathologically very nearly resembling his own. Again, the sufferer from dyspnœa, cough, and expectoration,—supposing his maladies, to all his own feelings and all practical purposes, limited to those three derangements,—is more closely related to another whose distresses are the same, although from widely different remote causes, than he is to a third person whose complaint is swollen legs and general debility, although these may arise from structural disease very like his own. The right arm may lose its power by injury to the nerves, to the spinal cord, or the brain; by venous or arterial obstruction; by rheumatic, lead, or other poisoning; by accident, or operation; and on the other hand tumour of the brain may cause amaurosis in one, imperfect speech in another, and paralysis of the right arm in a third. So the thoracic symptoms mentioned above may be due to chronic bronchitis, to heart disease, or to morbus Brightii, &c.; and patients suffering from them are more nearly related to the victims of slow phthisis, and of old pleurisy, than they are to others in whom the renal disease or the morbus cordis has produced œdema of the extremities and general weakness.

The sufferers from occasional convulsive paroxysms form a natural group,—limited in similar manner as regards their vital capacity, their social position, their prospects of life, in all its phases, except in that which is the lowest of all, viz., the probable duration of physical existence;—yet the conditions upon which those convulsions remotely depend are as various as are the organs of the body, and the varieties of change which they may undergo. Allowing this, we have the strongest objection that can be urged against the principle of classification that I propose. Yet this objection is, I think, feeble to the last degree when compared with that which can be raised against adopting either organ or anatomical change as the primary basis of classification. In regard of organ, let it be remembered that, for example, tumour of the brain may induce no symptoms except in the digestive organs;* that it may produce headache as almost its sole exponent, or blindness, convulsions, hemi-

* Abercrombie's "Pathological and Practical Researches in Diseases of the Brain and Spinal Cord," p. 472.

plegia, anæsthesia, vomiting, general emaciation, dementia, or insanity. Further, that disease of the heart may cause no symptom, or it may produce convulsions, dyspnœa, palpitation, swelling of the legs, ascites, headache, vertigo, or absolute incapacity for all exertion, through physical or moral causes, or the two combined. If, instead of organ, we regard pathological change as the primary basis of division, we have only to remember the different effects of inflammation, or œdema, or tubercle of either the lung, the glottis, or the joints; and to compare these in their several combinations and permutations in order to be convinced that it also is quite unfit for the purpose of primary classification.

Upon the system which starts with difference of organ as its basis of primary division, we arrive at special diseases, which have then to be described as assuming various clinical forms; thus Abercrombie details the different types of cerebral hæmorrhage,* and thus Durand-Fardel describes several forms of softening of the brain.†

The system which should commence with primary groups, formed by their having in common particular pathological conditions, would arrive at the same difficulty, or be encumbered by one still greater. Whereas the clinical arrangement is free from this fault, its peculiar evil being that diseases similar anatomically have to appear in two or more clinical groups. This was admitted and exemplified in my own work on Diagnosis.

The latter evil, however, appears to me the least of the three, because it represents in the book the condition of the facts of practical experience, and the order in which, as a rule, we advance from their simple observation to their interpretation. The patient complains of pain, of paralysis, of fits, of cough, of short breath, or of swollen legs; this is his first communication; and, from his symptom or group of symptoms, the physician advances to a discovery of the organ affected, and of the nature of its change.

Upon the principles laid down—viz., that disease is the sum-total of modifications in structure and function; that its measure is that of the degree to which life is limited or its actions perverted, and that its classification is most naturally based upon the

* Op. cit., p. 208, &c. † Traité du Ramollissement du Cerveau.

mode in which it effects this limitation or perversion—we come to regard "special diseases" as groups of modified function and structure, although the names by which they are denoted sometimes express only the one and sometimes the other.

Chronic convulsive diseases are a very definite group; they are, with few exceptions, readily recognised as such; and I propose in the following work to treat of them all, pointing out wherein they differ and wherein they agree, and advancing, by the discovery of the conditions upon which they depend, to a knowledge of the treatment which is appropriate to each.

§ IV. The symptoms of disease are the phenomena, or the feelings by which it may be revealed to the observer, or to the sufferer. Some of these may be appreciated by both, such as heat of skin, or an eruption; others can be recognised by the latter only, as, for example, pain, or numbness.

Symptoms resolve themselves into modifications of structure, such as hypertrophy, variolous pustules, &c., and of function, as, for example, paralysis, convulsions, flux, and the like. So that the symptoms are in reality part of the disease; and the problem of Diagnosis may be stated thus:—Given certain of the phenomena of a disease to find the others. This involves the discovery of the organ primarily affected, and the recognition of the nature of its change. The latter discovery is based upon a knowledge of Pathology; it is indeed the deductive application of that science. Hence Diagnosis rests upon Pathology, and the two support each other.

There was a period in the history of Medicine when disease was regarded as some mysterious entity taking possession of the body, and producing its various results; but although this period has long since passed, we should find it difficult to discover any resting-place between that view of disease and the one stated at the commencement of this chapter. The names by which different maladies are called, are often intended to express the essential facts in their existence; but a nomenclature constructed upon this principle would be exposed to unceasing change, or would soon become an unmeaning jargon. It is far easier to recognise a case of Bright's disease, than to say what is its essential condition; and the same is true of a large number of affections. Again, it is no less difficult to

determine the primary fact in many groups of diseases. We go backwards from effects to causes, from functions to organs, and may repeat the process almost *ad infinitum*, or until we find the line of causation returning into itself; and we know not at what point in the circle of life, and of our knowledge about it, the first irruption took place. We often cannot separate proximate causes of symptoms, or even remote causes of disease, from the disease itself, and are driven to accept the latter as a whole, and as a fact, some part of the order of whose events we may trace, but the first starting point of which, and the essential fact of which, we cannot positively determine. In the meantime symptoms must be regarded as parts of the disease, and the discovery of their relations as the problem of Pathology.

§ V. Some of the phenomena or symptoms of disease are physical, chemical, or textural alterations which may be immediately perceived; as, for example, heat of skin, urinary changes, enlargement or hardening of organs. Other physical or textural changes may be inferred from the effect they produce upon the mechanical action of organs. In this way auscultation and percussion elicit truth with regard to the state of lungs and heart. But there are other symptoms which we must term vital,—such as modifications of contractility, sensibility, and the like,—because, although we may express some of their results in physical or chemical terms, we do not by such terms express all the facts. We may detect excess of sulphates, phosphates, urea, or uric acid in the urine; we may perceive changes in the temperature of the body and in the excretion from the skin; but we can discover no structural change in the nerves, muscles, or brain of the patient who has suffered from chorea, delirium tremens, or mania; and we cannot express by either chemistry or physics the changes we have witnessed in mind, motion, or sensation.

§ VI. All vital actions, however, are accompanied by, and depend upon, some physical change in the living organism. In health, waste and repair balance each other, and there is a persistent textural result. The process of nutrition is interstitial, and too fine for our microscopes and test-tubes: but the vital actions of the organ depend upon, and are in proportion to these finer changes; and when the actions are abnormal in

degree or kind, it is because nutrition is, in like manner, different from that of health.

It is in thus regarding the relation between function and structure that we find, as it seems to me, a solution of the much-vexed question of functional disease. Thus, in 1855, I wrote, "If all that is intended (*i. e.* by those who assert the non-existence of functional disease) is that some physical change in the intimate organic processes of the tissues in question must take place as the essential conditions of their activity, and that some diminution or perversion of these processes must attend the increase or alteration of their functions, there is not only *à priori* evidence, and the deductive application of general laws, to warrant such an assertion, but there is direct clinical evidence of its truth. But these changes are totally distinct from those which are ordinarily meant by structural lesions, and are, as I have already said, conditions of vital activity, and not its cause.

"This mode of viewing the subject is of importance, not only in relation to those diseases in which no structural changes can be detected, but in reference to those which are connected with distinct pathologico-anatomical alterations. The immediate conditions of all such symptoms as result from modified functions being the intimate organic (vegetal) processes of the tissues, we can understand why similar symptoms arise from anatomical conditions, presenting coarse differences, and *vice versâ*. The mechanical changes, such as hæmorrhage, congestion, softening, &c., do not cause the symptoms directly, but by the intervention of secondarily induced alterations in the minute organic processes."*

If it is asked, which of the two, function or structure, is primarily affected? I reply, Neither; for the two are correlated, and are mutually dependent.

The application of these views to the interpretation of convulsions I attempted in a paper read before the North London Medical Society, and subsequently published in a provincial journal,† from which I quote the following:—

"Many of the 'symptoms of disease' are merely modified

* "Diagnosis of Diseases of the Brain," &c., p. 224.

† "The Liverpool Medical and Chirurgical Journal," Jan. 1858, p. 1 *et seq.*

vital actions; others are physical, others are chemical; but with regard to those of the first kind (vital), it is to be observed that there are two modes, each producing a special kind or class of symptom.

"(*a.*) Some symptoms are negative, *i. e.* they consist in the negation of vital properties. Of this kind are paralysis, anæsthesia, and the like; and it is at once evident that where only some links of the chain of vital processes, concurring to produce such complicated phenomena as voluntary movement and sensation, are exposed to observation, we cannot directly affirm wherein the negation lies. For example: the forefinger of the hand is paralysed: here is a negation of voluntary power over the muscles of that finger; and from the simple fact of the existence of the paralysis, we cannot say whether the muscles of the finger, the nerves of the forearm or arm, the spinal cord, or the brain, is affected. We may infer, from other circumstances, which is the more likely, but we can arrive at no definite conclusion from the fact itself.

"Symptoms of this negative character may be occasioned directly by some lesion easily recognisable by the anatomist, as, for example, the division of a nerve, softening of the spinal cord, or breaking up, by hæmorrhage or other causes, of the fibres in the cerebral motor tract; and thus many negative symptoms afford evidence of a solution of continuity in this or the other organ. They do not depend upon modifications of the nutritive or interstitial processes in those organs whose function it is to perform certain vital acts, but upon some interruption in the chain of organs by which these central vital acts are carried out.

"(*b.*) Other symptoms are positive, *i. e.* they consist in the excess or alteration of vital properties. Of this kind are spasms, pain, convulsions, and the like; and although we may not be able to say at once where the primary abnormal condition is, we can always assert that, inasmuch as the symptom is a modified vital act, it depends upon some modification of those nutritive processes which are the immediate or proximate cause of these and of all vital acts. For example: the forefinger of one hand is spasmodically contracted: here is an excess of muscular activity, and from the simple fact of its

existence we may not be able to say whether the muscles, the nerves, the spinal cord, or the brain, is primarily affected; but we are certain that, inasmuch as contractility and innervation are vital acts, and depend upon nutrition-changes in one or the other of the muscular or nervous organs, this spasm is due directly to some excess, or modification of those nutrition-changes.

"The difference, then, between negative and positive symptoms is this,—that whereas the former may depend directly upon some such rough lesion as a solution of continuity, the pressure of a tumour, or other mechanical conditions, the latter (positive symptoms) must always depend directly upon minute, interstitial changes, which are the necessary conditions and proximate causes of vital acts. Distinct lesions of organs may be the remote causes of positive symptoms; a tumour may cause spasm; but such causes are remote always: the immediate cause is the change of nutrition, the modification of the interstitial process.

§ VII. "Convulsions are modifications of vital actions, and therefore depend upon modifications of physical conditions.

"It is no objection to this general proposition, that frequently, *post mortem*, we can discover no organic change in the brain or spinal cord, for convulsions belong to the second category of symptoms, and depend upon modifications of nutrition.

"We may find a tumour in the brain, or tubercular deposit in its meninges; we may find disease of the kidneys, or such general derangement of the organs as scrofula or rickets can produce; but wherever we may find these easily-discovered physical changes, they are not the immediate causes of convulsion, for convulsion is a modified vital act of muscularity and nervous force, and its proximate cause is in the nutritive condition of the nervous centres.

§ VIII. "Convulsions depend directly upon nutrition-changes in the nervous centres.

"So long as spasm or paralysis, pain or anæsthesia, are confined to one muscle, or to a limited surface, it is possible, and often probable, that the lesion exists in the periphery, or in some channel of communication between the periphery and the centre; but when the disturbance involves all the muscles of a limb, of one side, and *à fortiori*, when all the muscles of the

body are involved, we conclude, and with reason, that the cause of disturbance is in that which is common to them all, viz., the nervous centre.

§ IX. "The immediate and proximate cause of convulsions is the same in all instances, when the convulsions are the same.

"Convulsions differ from one another in different individuals, and in the same individuals at different times. In some the spasm is tonic, or partially tonic, in others clonic; in some, certain groups of muscles are specially affected, as the respiratory (hysteria); in others, different sets of muscles—those of the limbs, for instance (meningitis), or of the trunk—are involved (spinal disease).

"When there is merely a difference of locality, the proximate cause is the same in kind, and differs only in the situation or portion of the nervous centre it affects.

"When the difference is one of degree, a similar conclusion is warranted with regard to the degree of nutritive change; but when the convulsions differ in kind, we must infer that the proximate cause varies also in kind.

"But cases of convulsion, although presenting certain peculiarities in different individuals, are in the main alike; they have the same general features, pass through similar phases, and produce similar results. Their essential feature is involuntary muscular spasm, occurring in a paroxysmal form, varying in degree and local distribution, but affecting (in order to come within the definition of convulsions) at least one-half of the muscles of the body, and more commonly the whole.

"Now, whatever lesions we may find in the nervous centres, or in other organs, whether these are spiculæ of bone, hydatid cysts, thickened meninges, softened brain, calculus in the kidneys, or Bright's disease, such lesions are not the proximate causes of convulsions; for they are not present in all cases: they differ in locality and kind, and they bear no constant proportion to the symptom in question.

"The laws of nature are invariable, and so-called exceptions are either ignorances or errors; statistics of per-centage do but represent the fragmentary or fractional condition of our knowledge, and our necessity for their use is evidence that we have not yet given full expression to those laws, some portion only of

which we may dimly see and register. But our conviction is,—and the possibility of science depends on such conviction,—that the laws are fixed and invariable, and that similar effects must have similar causes.

"The immediate or proximate cause, therefore, of convulsions is the same in all instances; it is some change in the nutritive or interstitial processes of the nervous centres.

§ X. "The proximate cause of convulsions is an abnormal increase in the nutritive changes of the nervous centres.

"The vital processes, muscular innervation and contraction, are correlated to the physical processes of assimilation and disintegration, and the excess of the one depends upon the augmentation of the other.

"As the chemical composition and decomposition proceeding in the cells of a galvanic battery give rise to or occasion the so-called 'current' in the wire which unites its poles, so the nutritive processes of assimilation and disintegration in the centre of motility, give rise to or occasion the impulse which shall pass through the nerves, and induce contraction of the muscles. If the chemical changes are increased in quantity or force, there is a correlative increase in the quantity or tension of the galvanic stream. If the nutritive processes are accelerated or increased, there is a corresponding augmentation of the vital result. In the former case the wire may become heated; in the latter, instead of simple tonicity, there may be spasm.

"The nutrition-changes which in health produce, as their vital effect, stability of tissue, secretion, sensation, and motion; occasion hypertrophy, flux, pain, and spasm, when augmented in degree.

"There are two modes in which the nutrition-changes may be so modified as to occasion abnormal vital acts, or positive symptoms. These are (first) acceleration, or increase in relation to time, and (secondly) an increase of mobility. Of the first the period of infancy is an example; of the second, scrofulosis or tuberculosis may be used as illustrations. In youth there is great rapidity of nutritive change, and there is also great vital activity with its tendencies to abnormal increase; in tuberculosis there is also rapidity, but there is besides this an instability of structure and a morbid readiness for change.

§ XI. "The remote causes of convulsion are such as induce an abnormal increase in the nutrition-changes of the nervous centres.

"The proximate cause being the same in all instances, the remote causes vary; but they agree in this, that they affect the nutrition of the nervous centres. Identical remote causes must produce identical effects (*i. e.* if *all* the causative conditions are identical); but in their examination we enter upon a deeply complicated assemblage of conditions, and cannot at all times trace the relation between them.

"What we have now to do is to indicate the general mode or modes in which these remote causes are carried forward to, and are productive of, the proximate conditions upon which convulsions depend."

The diseases commonly spoken of as the causes of convulsions—viz., tumour of the brain, meningitis, and the like—must be regarded as their remote causes, and the diagnosis of a convulsive disease is the discovery of the latter. In all cases, the particular organic condition upon which convulsions immediately depend—*i. e.* the proximate cause of convulsions—is the same. We have, therefore, to point out now the different modes in which it may be brought about.

A. It may be idiopathic, or primary; a *morbus per se*. In such cases, the sole deviation from healthy structure is the intimate nutrition-change: the only variation from normal function is the convulsion.

That such convulsive disease does exist thus primarily is the only warrantable induction from experience, and a perfectly logical deduction from general pathologic laws. For, on the one hand, minute investigation has hitherto failed to discover any further lesion; and, on the other, while nutrition is known to suffer changes from the healthy standard, there has not been shown any reason for excluding from the possibility of such changes the nervous centres.

To controvert this position, *à posteriori*, it must be shown that in all cases there is some further deviation from healthy structure: to oppose it successfully, upon *à priori* grounds, it must be proved that, while in the osseous or membranous tissues it is quite possible for such a nutrition-change to occur as shall result in a spicula of bone, in the nervous tissue it is quite impossible

for such a nutrition-change to take place as shall result in a convulsion. The *onus probandi*, therefore, lies upon those who assert that the organic condition upon which convulsion depends is not, and cannot be idiopathic.

But further, the position assumed is in perfect harmony with general pathologic laws. For inasmuch as the first deviations from health of organ are in the majority of instances minute interstitial changes which may or may not gradually eventuate in departure from structural integrity, there is no reason for excluding from such susceptibilities that particular organ, the minutest changes in which are well known to produce some of the most striking vital results.

One difficulty which has arisen in the minds of many, is due to the apparent want of proportion which exists between such slight interstitial or other changes as exist in structure, and such violent and extensive phenomena as convulsion. But this difficulty disappears when we consider that in health there is precisely the same apparent want of proportion between the physical change and the functional effect. For example, between the flaccidity of a muscle, and its tension to such a degree as to support or raise many pounds weight, the difference is enormous; but it depends upon slight interstitial changes. And again, if we regard the peculiar properties of organs, we shall see that the structural change which in one is unnoticed, may in a second become dangerous, and in a third fatal; for example, œdema of the ankle, fluid in the pericardium, and œdema of the glottis. And still further the excess of action of different organs, even when carried only to the same degree, is productive of results differing widely in their consequence; for example, cramp in the gastrocnemius, cardiac spasm, and closure of the larynx.

Another difficulty is of an opposite character, viz., that in many cases extensive lesions of the nervous centres have been discovered *post-mortem*, to which there were no corresponding symptoms during life. But such combinations certainly do not prove the necessity for the existence of great structural changes to account for symptomatic deviations from healthy action. On the contrary, they show that the relation between these two classes of events is not that which has been usually supposed:

and further that great alterations of, and departures from organic integrity may exist in some parts, without entailing in others those minute changes which are the immediate causes of certain symptoms.

On the one side, therefore, we have evidence that some of the most notable vital effects, both in health and disease, are dependent upon interstitial processes so subtle as to elude observation; that slight deviations from healthy structure produce phenomena, varying in importance in proportion, not to the amount of deviation, but to the value of the organ involved; and that the notability of symptoms is in relation to the nature of the function affected, rather than to the degree in which that function may be modified. On the other side, we can prove that extensive structural changes, involving considerable portions of certain organs, are not necessarily associated with marked symptomatic phenomena. And, as the result of this consideration, we are entitled to defend the general proposition, viz., that the particular organic condition upon which convulsions depend, may be primary or idiopathic; not only because the *onus probandi* lies upon those who assert the contrary, but because the proposition itself is in harmony with what we know of general pathologic laws.

In such cases, all that necessarily exists is such a perversion of nutrition, that convulsion is its vital result. This perversion may be the result of hereditary taint, or of conditions developed after birth. All that exists is an altered nutritive process, the tendency to which is innate or acquired; and there is no greater difficulty in understanding this condition than in comprehending a tubercular or carcinomatous diathesis. For, prior to the development of either tubercle or cancer as a deposit or growth, we assume the existence of a tendency which will eventually reveal itself; and this is all that we assume with regard to convulsion. The difference, however, is this, that whereas in regard of the former the tendency reveals itself in an appreciable structural change, miliary tubercle or scirrhus; in the latter the tendency does not necessarily reveal itself except in symptoms. The assumption is the same in each, viz., that a morbid character is impressed on the very centre of vitality, the nutritive force: the direction of its influence differs, in the one producing textural

results, in the other vital. If, then, we allow that vital functions depend upon minute interstitial nutritive processes, and that the contraction or repose of a muscle has for its causative condition such a process as does not entail any necessary deviation from textural integrity; and further, if we allow the existence of a tendency impressed upon nutrition in such manner as the tuberculous or carcinomatous, which may be connate, and yet undeveloped, structurally, until twenty or forty years of age, we do not admit the existence of anything less defined or more improbable when we allow the existence of such a morbid condition of the nutritive process that convulsions are its vital results.

Further, there is nothing in the nature of convulsive phenomena which, *per se*, necessitates the supposition of anything beyond a mere modification of the ordinary healthy processes; in other words, there is nothing for which these processes will not account. There is muscular contraction on the one hand, and loss of consciousness on the other; but that these are quite compatible with healthy structure is shown by their forming part of the daily life-processes of all.

B. The particular organic condition upon which convulsion depends may be secondary to other changes in the organism.

In such cases the sole deviation from healthy structure may be an intimate nutrition-change; but the latter, instead of being idiopathic, is the result of some other morbid condition.

To this category belong many cases of so-called epilepsy, especially those which may be satisfactorily referred to the operation of an irritant agent in any part of the organism, and which are cured by the removal of the source of irritation. Such cases ought to be included with dentition-convulsions, fits from worms, and analogous examples, in one general group of "eccentric convulsions."

The proof that convulsions in any case are purely eccentric, in regard of their primary causation, depends upon their disappearance when that irritation is removed. The probability is that they were not purely eccentric if they persist after such removal; for those which remain have no title to be placed in that category. In the former case there is nothing to show the existence of anything beyond a violent, but still physiologic,

reaction against an exciting cause: in the latter we may infer that, in the organism itself, there was more than the ordinary reflective energy, amounting to a tendency to convulsion; and that this, although incapable of spontaneous development to such a degree as to cause a paroxysm, is capable, when once intensified and developed, of self-perpetuation.

We have, then, degrees of convulsive tendency which may be partially estimated by a comparison of the mode in which convulsions are induced. The highest is that in which the tendency develops itself without any external provocative; the lowest is that in which the development takes place, in the first instance, and is afterwards reproduced only in dependence upon such eccentric irritation; and between the two is that which, when once induced, is capable of self-perpetuation.

In estimating the primary or secondary causation of convulsions, and in determining the share taken in the latter by the morbid tendency and the eccentric occasion respectively, regard must be paid to the force of the irritation, and the length of time during which it has operated, and also to the relation which these sustain to the convulsive effect.

If a man receives a violent blow on the head, has a limb crushed by machinery, or swallows a narcotic or powerful irritant, we should not infer that he was endowed with any special proclivity to convulsion, from the mere fact that such an event followed his accident: but if an individual is attacked with convulsions after taking such an indigestible meal as would not affect another, or might simply occasion him an hour's inconvenience; and if after any indigesta such a result should follow at subsequent times, then, although the case might be considered one of eccentric convulsions, there would be ample indications of the presence of a morbid tendency to this kind of disturbance,—a tendency highly dangerous, and to prevent the full development of which the greatest caution should be employed. *Cæteris paribus*, the convulsive tendency is inferred to be strong in inverse proportion to the violence of the irritation.

But it is also to be observed, that a source of irritation acting upon a given organism only for a certain time may be insufficient to occasion convulsive phenomena, and yet, if the same

irritation is continued for a longer time, such results may be produced. Thus, in the child, irritation from teething or from ascarides may be enough to cause strabismus, starting from sleep, carpo-pedal contractions, and the like symptoms; but if the irritation ceases naturally, or by the intervention of art, no further disturbances may occur; while such irritation, by its frequent repetition, or prolonged continuance, may be the occasion of convulsions.

There are, then, different combinations which may be placed in the same general category of eccentric convulsions:—1st. Those in whom the organic condition, which is the immediate cause of convulsions, may be, without special predisposition on the part of the individual, induced suddenly by an eccentric irritation. 2nd. Those in whom that condition is produced by the joint operation of a pre-existing organic tendency and an external disturbance; and 3rd. Those in whom the organic condition is, without special proclivity to disturbance in the individual constitution, gradually brought about by the prolonged influence of an eccentric irritant.

The general mode in which an eccentric irritation passes over into convulsion is the same in each instance, viz., by inducing the peculiar organic condition upon which the paroxysm depends. An impression made upon an afferent nerve determines, not only in it, but in the centre to which it is attached, an interstitial change; and this latter is the cause, or essential condition of a motor impulse, which is transmitted along a motor nerve to the contractile fibres of the muscles or the vessels. In such a conversion of impression into motion, we have the simplest idea of a "reflex" action. In obedience to an impulse from without, the centripetal nerve effects a change in the nutrition of the centre, or of that organ which is common to it and to a motor nerve; and this change, when of a certain kind and degree, is the necessary cause of a motor impulse and a muscular result. Under ordinary circumstances, the impressions, starting from the mucous membrane of the pharynx, are as definitely related, in this manner, to the muscles which accomplish the movements of deglutition as are any purely physical effects with which we are acquainted in the external world. And under extraordinary circumstances, the impressions,

starting from the skin of the neck or from other parts of the body, are as certainly related to the muscles whose contraction constitutes a convulsion as are any physical or physiological effects that have been hitherto described.*

In this altered central nutrition, therefore, we recognise the peculiar organic condition upon which convulsion depends; and we see, further, that it may be immediately produced by an impression from without. The evidence on the latter point is derived partly from experimental inquiry and partly from clinical observation. Experiment has shown that the primary fact in convulsions is a peculiar condition of some portion of the nervous centres, which may be induced artificially;† and clinical observation has shown that convulsions may arise from eccentric irritation, and be cured by the removal of the latter.‡ In such circumstances, therefore, the only conclusion we are warranted in forming is that the organic condition of convulsions was the direct result of the irritation.

There is no further difficulty in accounting for the operation of eccentric causes; for, if an irritation is capable of originating convulsive conditions without pre-existing proclivity to their occurrence, *à fortiori*, is it capable of so doing when that proclivity exists.

The mode in which prolonged irritation operates is, although explicable upon the foregoing principles, further elucidated by other considerations. A certain degree of stimulation is necessary to produce a certain motor effect. This is to be observed in regard of all reflex operations, from the contraction of the iris in proportion to the amount of light, to the contraction of the muscles of the leg in proportion to the irritation of the skin, in paraplegia. But further, certain reflex actions in health appear to be occasioned only after, not the increase in amount of intensity of the impressing cause, but after prolongation or repetition of that cause; for example, respiratory movements, uterine contractions, and emissio seminis. And again, the experiments of M. Brown-Séquard show that time is required for the establishment of the convulsive conditions even

* Researches of M. Brown-Séquard on Epilepsy.

† Brown-Séquard's "Researches on Epilepsy," p. 4.

‡ Portal, "Traité de l'Épilepsie," pp. 158 and 210.

in those animals in which they are brought about by lesion of the spinal cord.

The term "irritation" has been used in the preceding paragraphs because it is one the general meaning of which is readily understood, but it must be freed from certain possibilities of misinterpretation.

It is not to be thought that this kind of irritation bears any definite or constant relation to pain. On the contrary, it is most frequently observed that the irritants which induce convulsion are accompanied by little suffering; and further, that the individuals in whom convulsions occur, from such eccentric causes, often bear very severe pain without such results. Thus, an individual in whom convulsions are the frequent result of painless indigestion, may have a tooth extracted without suffering a fit; and the child whose attacks have been caused by dentition, the distress from which is only evinced by occasional fretting, may feel so much pain at the lancing of its gums as to scream violently, and yet no paroxysm follows.

Again, the irritation is not necessarily even accompanied by sensation. In M. Brown-Séquard's artificially induced epilepsy of the guinea-pig, mere contact, or blowing on the surface of a certain portion of the neck, was sufficient to induce attacks; whereas the most violent irritation of the leg which was in a state of hyperæsthesia was not followed by the paroxysm.* M. Brown-Séquard argues, and with conclusiveness, that "fits are caused by a peculiar and unfelt kind of irritation;"† and that this may or may not co-exist with the feeling of pain, cramp, formication, &c.

The eccentric irritation may be due to some foreign body brought in contact with the afferent nerves, such as ascarides, indigesta, &c., or it may be the result of disease originating in any part of the body.

C. The particular organic condition upon which convulsions depend, may be part of a systemic or general disease, or morbid tendency. In such cases the nervous centres are involved with other organs and tissues in a general nutrition-change.

To this category belong cases of convulsion associated with,

* Researches on Epilepsy, p. 6. † P. 31.

and apparently having for their cause, such general cachexiæ as tuberculosis, scrofulosis, rachitis, and syphilis; such morbid blood-conditions as urinæmia, anæmia, pyæmia, and other toxæmiæ, arising from changes occurring within the system; such blood-diseases as alcoholism, lead-poisoning, typhus, variola, and other exanthemata; such profound general modifications of nutrition as accompany the progress of disease in certain important organs, *e. g.* pneumonia, carditis, pericarditis; and lastly, such as attend certain developmental periods,—for example, puberty, pregnancy, dentition, and the like.

When convulsions occur in a well-marked instance of any one of the cachexiæ, it may be that they are primary, or idiopathic; it may be that they are secondary or dependent on eccentric irritation; and further, they may be symptomatic, or produced by the irritation of the nervous centres, as in tubercular meningitis. But over and above these three modes of production, there are numerous cases which require another explanation: viz. this, that the convulsions are the direct expression of the cachexia which is present; the nervous centres being involved in that general nutrition-change which is the essential element of the cachexia itself.

That which is common to these general disturbances of nutrition, is an increase in the molecular changes of the tissues, accompanied it may be by an increase of material, the latter often assuming a form which is foreign to the organism. Virchow describes as the third form of general nutrition disturbance, "der Theil nimmt ueberschuessiges Material auf; die Bewegung steigert sich (progressive Metamorphose), und zwar (*a*) in der Richtung des alten Gewebes (Hypertrophie, Hyperplasie), (*b*) in einer fremden Richtung (Heterotrophie, Heteroplasie)."*

The occurrence of an increased molecular movement in an organ or tissue is commonly associated with an augmentation of its vital function; so that whereas on the part of a secreting organ such abnormal increase will occasion a greater quantity of secretion, a similar excess on the part of an organ of innervation will give rise to pain, spasm, or delirium.

* "Handbuch der speciellen Pathologie und Therapie, Erster Band," p. 273. Conf. "Allgemeine Störungen der Ernährung," p. 271, and "Allgemeine Formen der Störung," pp. 15 *et seq.*

In regard of the toxæmiæ, doubtless a frequent mode of causation of convulsions is the direct action of a certain poison upon the nervous centres. Thus, Frerichs has shown that carbonate of ammonia, resulting from the decomposition of urea in the blood, exerts an action which may be imitated by its artificial injection.* But the forms of disturbance in the nervous centres of urinæmic patients vary widely, and it seems probable, as Dr. Walshe suggested, that more than one poison may be developed from the decomposition of urea in the blood. But whether there are several or only one, their mode of action must be by inducing that nutrition-change upon which convulsions depend. Allowing, however, that the nutrition may be thus affected through a distinct agency in the blood, this agency being the product of a local disease, we cannot by such means explain every case. For the existence of poisons has not yet been demonstrated, but only inferred, in other toxæmiæ. That which is definitely ascertained is that there is a profound change in the general nutrition; and this exhibits itself in the functions of almost every organ, producing altered secretions, oppressed or painful sensations, deficient power, and exaggerated motility. The nervous centres in such conditions partake of the general change; and while in some cases rigors, cramps, jactitations, subsultus tendinum, vertigo, delirium, and stupor, may be the only phenomena which are presented, in others sudden loss of consciousness and violent convulsions may ensue.

With regard to those diseases which result from the introduction of poisons foreign to the organism, similar remarks apply. In fever convulsions arise in the same manner as headache, oppression, rigors, heat of skin, and foul secretions; viz., by the profound alteration of nutrition; and the same is true, probably, of chronic alcoholism, and lead poisoning. But in acute poisoning it may be that the particular agents employed, —opium, and some narcotic irritants, for example,—exert a specific influence upon the nutrition of the nervous centres, the latter being disturbed independently of any general assimilative change.

* "Die Bright'sche Nierenkrankheit, und deren Behandlung," pp. 107 and 278.

In a similar manner we must interpret the occurrence of convulsions in pneumonia and pericarditis. It certainly is not found that convulsions bear any constant proportion to the amount or intensity of pain which local diseases may occasion. Nothing can exceed the suffering sometimes caused by lumbago, pleurodynia, the passing of biliary or renal calculi, the onset of pleuritis; but such affections rarely exhibit the complication of convulsions: while the pain of pneumonia, or of pericarditis may be extremely trivial, and yet this complication shall occur. On the other hand, it is quite certain that the last-named diseases are frequently the expression of a previously existing morbid nutrition, and are almost invariably attended by profound changes in the assimilative power of the whole organism. The conclusion, therefore, is obvious, that, besides operating as excentric irritants, diseases of particular organs have the power of occasioning convulsions, in proportion to the degree in which they effect or express a general nutrition-change; and the inference is, I think, warranted that the mode in which convulsion is brought about is by the involution of the nervous centres in this general condition.

The mode in which dentition, puberty, &c., operate, is more fully discussed in regard of epilepsy. (See Chap. V., Pathology.)

D. The particular organic condition upon which convulsions depend may be originated by more or less contiguous structural disease.

Thus, an intracranial tumour, a chronic inflammatory condition of the meninges, a process of softening and disintegration of the brain substance, or any other structural change in the nervous centres or their appendages, may set up that peculiar interstitial or molecular change which is the immediate cause of convulsion.

The structural diseases which are found in association with convulsions are not the immediate, but the remote causes of the latter. "They act by inducing those interstitial changes which are the proximate cause;"* and it is because this relation has been misunderstood, that so much confusion has existed in cerebral pathology.

* Liverpool Medico-Chir. Journal, Jan. 1, 1858, p. 9.

There are two classes of facts upon which the above proposition rests. 1st. That either of the phenomena, viz., the convulsions or the structural lesions, may exist without the other; and 2nd. That when the two co-exist, the lesion is often found in parts which experiment has shown to be incapable of producing the phenomena directly.

Any other supposition than that of this indirect relationship is inconsistent with the facts of pathology: whereas it is in harmony with what we know of both symptoms and structural diseases. Particular lesions may cause certain phenomena directly; for example, a tumour or softening in certain localities may be the immediate cause of anæsthesia or paralysis: but the gross structural change cannot produce directly that which is immediately dependent upon increase of action. The negative symptoms accompanying the positive, and those of the latter which may be over and above the convulsions, are of great service in arriving at a diagnosis; but, when regarding the two classes of symptoms from a pathological point of view, and endeavouring to trace their relations to the organic conditions found *post mortem*, we cannot too carefully separate the one from the other.

There are at least two modes in which lesions or diseases of certain nervous elements may pass over to, and affect others. 1st. Tissues may be involved by contiguity, *i. e.* a particular element being diseased, as, for example, the vessels with calcareous deposit, or the meninges with excessive fibrinous exudation, adjacent elements—such as the optic commissure or the tubercula quadrigemina—may have their nutrition impaired, not in such manner as to exhibit structural change, but to such a degree as to cause ocular spectra, amaurosis, or convulsions. But 2nd. The lesion or disease of one element may affect another less directly; the elements alluded to may not be contiguous, and their association is effected through a third; for example, hæmorrhage into the crus cerebri of one side causes hemiplegia on the opposite side of the body; and this is its direct or immediate effect. A similar lesion in the hemisphere may so influence the nutrition of parts in the neighbourhood of which it occurs, either by mechanical pressure, by infiltration of the tissues, or other means, that pain, formication,

or spasm, may occur in the hemiplegic side; and these are its indirect or remote effects, brought about through contiguity of central organs: but the hæmorrhage may extend into the arachnoid cavity, and instantaneously a paroxysm of general convulsions is observed. Now, this result depends directly upon a nutrition-change of the motor centre; and,—inasmuch as the latter is not, in the case supposed, involved in the lesion,—its altered state is an effect of the hæmorrhage, brought about by means of that which lies between the surface of the arachnoid cavity on the one side and the motor centre on the other, viz., the intermediate nerve-tissue.

It is by this transference of an irritation from one part of the central nervous system to another, that we must explain the mode in which hydatid cysts or bony spiculæ, for example, between the convolutions on the upper surface of the brain, induce convulsions or other positive disturbances in the functions of those parts which are separated from them by a considerable space. And it is in a like manner that the artificial lesions of the spinal cord which M. Brown-Séquard has shown to be followed by convulsions, produce the latter phenomena.* The order of causation is in such cases precisely the same as that which is observed in eccentric convulsions; the difference being, that in the latter the irritation exists at a greater distance from the motor centre. In many cases, then, the convulsions arising from inflammation set up by a developing tooth, occur in the same manner as those arising from an inflammatory condition of the meninges; and they are not more centric in the latter instance than in the former. If then we use such terms as centric and eccentric in regard of convulsions, we must bear in mind that such terms apply with strict propriety only to the conditions of remote causation; and that this is the meaning that they have when employed to distinguish convulsions which arise from intracranial disease from others set up by irritation in other parts of the body.

The mode in which various lesions in the nervous centres produce similar symptoms, has been gradually explained by our knowledge of reflex actions upon the vaso-motor nerves;

* Researches on Epilepsy, p. 68.

a knowledge derived from a series of experiments and observations conducted by Bernard,* Brown-Séquard,† Pflüger,‡ Lister,§ and others. These tend to show that the function of one portion of those centres may be exalted or diminished through a reflex action, which determines enlargement or contraction of its vessels, in obedience to an irritation proceeding from some other part. In this way nutrition is affected, and with it there is correlative change in vital activity.‖ The functional relations of the several portions of the nervous centres, and the reasons for thinking that the immediate causes of almost all muscular movements are to be found in the parts at the base of the brain; and that the latter are not only acted upon from below, by eccentric irritation, but also from above by centric conditions, were described by Dr. Carpenter;¶ and thus the intermediation of those organs or ganglia was shown to be the key to explain much of the discrepancy between clinical observations, and much of the difficulty in cerebral pathology.

It is by a recognition of the fact, that contractions in the muscles of the limbs, or in the fibres of the blood-vessels, are directly due to impulses derived from the centre of reflex action, and that these may originate from afferent impressions in any part of the body—viz., in the cerebral hemispheres, or in the mucous membrane of the stomach—that we bring into the same category the convulsions from ascarides, and those from tumours in the brain. It is by perceiving that this reflex action may, by augmenting or diminishing the vascular supply in different portions of the brain, give rise to either delirium, pain, and spasm on the one hand, or coma, anæsthesia, and paralysis on the other, that we discover the relation between these symptoms when arising from general systemic disease, or structural alterations of organs remote from the nervous centres, and when occurring in connexion with cerebral or spinal change.

* Leçons sur la Physiologie et la Pathologie du Système nerveux.

† Researches on Epilepsy.

‡ Die sensorischen Functionen des Rückenmarks.

§ Philosophical Transactions. Part II. for 1858.

‖ These views have been elaborated, with great care, while this work has been preparing for the press, by Dr. Brown-Séquard, in his Gulstonian Lectures at the Royal College of Physicians.

¶ Principles of Human Physiology. Edition IV., 1853.

And thus, not only is the pathology of the nervous system made much clearer than some years ago it appeared possible that it should ever be, but that of all other organs has received light from this partial solution of the mystery of nervous action.

§ XII. The classification of convulsive diseases may be effected by regarding the various groups of remote causes. We have then the following :—

I. Idiopathic convulsions ; including,—
 Epilepsy proper ; "idiopathic epilepsy."
 Eclampsia puerorum ; "idiopathic convulsions" of children.

II. Secondary, or eccentric, or sympathetic convulsions ;—
 "Sympathetic epilepsy ;" uterine, gastric, &c.
 "Sympathetic convulsions" in children.

III. Diathetic, or cachectic convulsions ; from,—
 General nutrition-changes :
 Healthy in kind, but morbid in degree ; puberty, &c.
 Morbid in kind and degree ; tuberculosis, scrofulosis.
 Toxæmiæ, arising from,—
 Retained excreta; urinæmic convulsions, "renal epilepsy."
 Metamorphosed plasma; pneumonic convulsions, rheumatic, &c.
 Poison introduced from without ; "syphilitic epilepsy," lead, variola, &c.

IV. Symptomatic convulsions ; from centric disease,—
 "Symptomatic epilepsy," from
 Disease of meninges; tubercle, syphilis, traumatic, &c.
 Disease of nervous centres; tumour, softening.

In this volume I propose treating only of epilepsy proper, viz., of that form of idiopathic convulsions to which I believe alone the name of epilepsy ought to be applied.

Recapitulation. I. Disease is the sum-total of modifications in both function and structure. Its name may describe those of the one, or of the other ; but it is the combination of them both.

II. The measure of disease is, not merely kind or amount of

organic lesion, but the degree in which the activities of life, as a whole, are perverted or limited.

III. The natural classification of disease is primarily based upon similarity in the mode of perversion or limitation. Thus groups are formed, having practical or clinical resemblance, though differing in regard of the organs structurally affected, and in the nature of their change. Similarity of prominent symptoms is the groundwork of the first division into classes.

IV. Symptoms of disease are its appreciable changes in structure or function; they are parts of the disease itself; and from them we have to infer the others, which are inappreciable, but which, with them, constitute the whole disease.

V. Some symptoms are physical, chemical, or textural; others are vital, and can only be expressed in peculiar terms—viz., those of vitality.

VI. Vital processes are necessarily correlated with physical change; neither ever occurs without the other. Hence so-called functional derangements imply the existence of modifications in the interstitial processes of the organs. Coarse lesions are, then, the remote causes of many symptoms; and that which intervenes between the two is minute, nutritive change, which may or may not affect textural integrity.

a. Negative symptoms, or the simple absence of function, may be occasioned directly by solution of continuity in portions of the body.

b. Positive symptoms, such as excess or perversion of action, always depend directly upon minute, interstitial change, which may be all that exists, or may be induced by some perceptible lesion.

VII. Convulsions, being modified vital actions, depend on modified physical conditions, although these may escape detection.

VIII. These conditions are nutrition-changes in the nervous centres.

IX. Their nature is the same in all instances where the convulsions are the same.

X. Their essence is abnormal increase in the molecular changes of the nervous centres.

XI. The remote causes of convulsion are such conditions as

induce this abnormal increase. These remote causes it is the object of diagnosis to discover.

A. The change in question may be idiopathic or primary; *i. e.* a *morbus per se*. This is warrantable from experience, and from general pathologic laws. It may be developed hereditarily, or from conditions operating after birth. Disease must begin somewhere, and there is no ground for saying that it shall not begin in the reflective centre, and in this form.

B. Morbid increase of nutrition-change may be secondary to some other abnormal condition. The latter may be an "eccentric irritation," the intensity of which may be alone sufficient to produce the effect; or which may be such as to require "predisposition" in order to cause convulsion. "Irritation" does not necessarily involve either pain or sensation; it is an "occasion" of vital action.

C. The nutrition of the nervous centres may be involved in a general change. This may be that denominated cachexia; toxæmia, developed from within, or introduced from without; blood-change dependent upon organic disease; or that general change which attends certain leading periods in the development of the body.

These conditions may concur with others, A and B, or they may exist alone.

D. The conditions upon which convulsions depend may be occasioned by structural disease in contiguous portions of the nervous centres.

1. The reflective centre may be involved in actual and definite disease, extending to it from other parts of the cerebro-spinal system; or 2. It may be affected through reflex irritation. In the latter case, the causation is, though locally different, similar in kind to that described under the name of eccentric irritation (B).

XII. Upon these differences in remote causation the classification of convulsive diseases depends.

CHAPTER II.

DEFINITION AND NOSOLOGICAL POSITION OF EPILEPSY.

"Few diseases are better characterised by their symptoms than epilepsy; yet, in this instance, there is such a variety in the phenomena as renders it difficult to contrive a definition in a few words, which may comprehend every form of the complaint."—PRICHARD.

EPILEPSY cannot be defined by any anatomical change; for no structural condition has been hitherto found with sufficient frequency to be regarded as an essential element in its production. So universally is this admitted that, although attempts have been made to show the presence of organic lesions as its essential cause, the names by which the disease has been known have borne no relation to such lesions.*

Epilepsy cannot be defined by any one symptom which is peculiar to, and pathognomic of its presence. Those phenomena which reveal its existence, viz. loss of consciousness and involuntary muscular contraction, exist not only in other diseases, but in health. In sleep, as well as in apoplexy, both perception and volition are suspended: in respiration, as it is affected when violent exertion is made, as well as in hysteria, there is involuntary muscular contraction. The mere presence of either spasm or loss of consciousness does not, therefore, constitute epilepsy.

* One of the most recent authors who may be cited in confirmation of this position is Dr. Hoffman, of Frankfort, whose examination of the bodies of fifteen epileptics is thus summed up by Köhler (Schmidt's "Jahrbücher," 1859, Bd. 104, p. 133): "Bei den Epileptikern aber fanden sich durchschnittlich keine hervorragenden und specifischen Sektionserscheinungen, ausser etwa lokale Blutüberfullungen, und Vf. hält die Epilepsie für noch viel immaterieller als die Seelenstörungen."

The combination of symptoms, as a mere combination existing at a particular time, does not enable us to define the disease. Loss of consciousness and involuntary spasm occur during sleep; in cases of ventricular hæmorrhage; of hysteria; of acute red softening, and the like.

The particular form which such combinations may assume cannot be employed as a definition of epilepsy; for, on the one hand, the name is extended to various forms of convulsion,—"le petit mal," as well as "le haut mal," of the French authors; and, on the other, the convulsions of infancy, of parturition, of narcotic poisoning, and of urinæmia, are often precisely similar to those of epilepsy.

But, although there is no one symptom or combination of symptoms, the presence of which indicates positively the existence of epilepsy, there is a symptom, in the absence of which it would be impossible to assert that epilepsy was present. This symptom is loss of consciousness; and it is the characteristic phenomenon of the disease.

As it has already been shown, however, that mere loss of consciousness is not, *per se*, indicative of epilepsy, the distinctive character of the disease must be sought in the conditions of that symptom, and upon those conditions the disease may be defined.

Dr. Todd states, that "the pathognomonic symptom of the disease is a sudden and complete loss of consciousness;"* but this is true only when we add, occurring as a paroxysmal or occasional event. Sudden and complete loss of consciousness may be observed in cerebral hæmorrhage, or cerebral congestion; but the occasional repetition of the event, and its temporary duration, are the conditions which render it distinctive of epilepsy.

It has been said, even by those who regard loss of consciousness as the essential phenomenon of epilepsy, that in defining the disease we must combine, with that symptom, involuntary muscular contraction. Thus Portal makes the following statement:—"La convulsion tonique ou clonique d'un seul muscle suffit pour caractériser l'épilepsie, s'il y a perte de connaissance;"† and Maissonneuve thus defines the disease:—"La coincidence au moins imminente de la perte de connaissance, et de sentiment

* *Medical Times and Gazette*, August 5, 1854, p. 129.

† Observations sur la Nature et le Traitement de l'Épilepsie, p. 140.

avec les convulsions."* But to such statements it must be replied, that cases occur not infrequently in which no such convulsion or even transient and local spasm can be positively observed, and yet the whole character of such cases and their ultimate development is such as to leave no doubt of their epileptic character. (See Case IX.)

While, however, excluding from the definition of epilepsy a symptom which is not shown to be universally present, it should be stated, that there are grounds for believing that in epilepsy loss of consciousness is invariably associated with, and dependent upon contraction, the result of a motor impulse; but that this impulse may be confined to the contractile fibres of the cerebral vessels.† The element of spasm, therefore, is not denied, but affirmed to be one that is essential to the existence of epilepsy; but it is asserted that this element does not necessarily occur in muscles which are exposed to observation.

Epilepsy may then be defined to be *a chronic disease characterised by the occasional and temporary existence of loss of consciousness, with or without evident muscular contraction.*

Epilepsy should be regarded as an idiopathic disease, *i. e.* as a *morbus per se,* distinct from eccentric convulsions, from toxæmic spasms, from the convulsions attendant upon organic lesion of the cerebro-spinal centre, and, in fact, from every other known and appreciable malady.

The special organic condition upon which it depends may be induced in various ways, but it may occur primarily; and, in the vast majority of cases of epilepsy proper in the human subject, there is no evidence to show that the disease is other than idiopathic and primary.‡

In 1855 I made the remark that, "if we can succeed in distributing all the cases hitherto known as epilepsy among the several classes of better defined diseases, we ought to reject the term epilepsy from our nosology: but if we cannot accomplish this distribution, and are compelled to recognise the existence of many, or even of a few, cases distinct from any more general condition of systemic or local disease, then we must employ the

* Recherches et Observations sur l'Épilepsie, p. 36.

† *Vide* Chap. V., Pathology.

‡ For the sense in which these terms are used, and the reasons why they are applied to epilepsy, the reader is referred to Chapters I. and V.

term epilepsy in a restricted sense, implying only those cases which, in the present state of medical science, are irreducible."* But this principle of nomenclature—which appears little more than a truism, self-evident, and requiring no argument for its support—is not that which has been acted upon; and at the present time we constantly hear of renal epilepsy, uterine, gastric, and other epilepsies; epilepsy from tumour of the brain, and other organic diseases; and find these confounded together with the simple or idiopathic affection.

The principle which is now re-asserted is this, that inasmuch as there are numerous cases of epilepsy in which neither organic lesion, blood disease, nor definite excentric irritation can be shown to exist, epilepsy is idiopathic in these cases; that such idiopathic disturbance is all that exists in them, and that it fills up to the full, in numerous instances, the idea of epilepsy; and that, therefore, when in other cases structural lesions, blood diseases, or excentric irritations, are found in connexion with convulsions which they are shown to produce, we ought not to call these latter by the same name.

A mere similarity, or even identity, could that be shown to exist, of the phenomena of convulsions as they occur in different individuals, does not prove the identity of the whole disease from which such individuals are suffering. Such similarity merely shows that the immediate cause of these convulsions is alike in each, whereas the remote causes may differ widely. As dyspnœa may arise from spasmodic asthma, from emphysema of the lung, pneumonia, dilated heart, pleuritis, pleurodynia, anæmia, or from effusion, the result of blood-poisoning, in Bright's disease, so convulsions may occur from a number of conditions, bearing no nearer relation to each other. And as it would be simply absurd and retrogressive to describe the various diseases above-named as different varieties of asthma, so it is equally absurd to describe many of the forms of convulsion as varieties of epilepsy. From a consideration of dyspnœa alone some diagnosis might often be framed, and from a regard to the particular form of convulsive paroxysm, some diagnosis may be aimed at in many cases; but it is from the mode in which these

* Diagnosis of Diseases of the Brain, Spinal Cord, Nerves, and their Appendages, p. 174.

two symptoms are developed,—from the other symptoms which accompany them, and from their relative proportions,—that a diagnosis is possible in the one case and the other.

As one main object of the present treatise is to show that the large group of diseases commonly confounded under the one name, epilepsy, consists of several distinct affections, which may be diagnosticated during life, it is important to pass in review the evidence which there is for the existence of real epilepsy as an idiopathic disease.

1st. Epilepsy is an idiopathic affection because no general organic condition has yet been discovered with which it is constantly associated, or which, being present even to an extreme degree, necessarily induces it.

It is not my purpose now to enter in detail upon those arguments which support this proposition. They will find their place in Chapter III., Symptoms; Chapter IV., Natural History; and Chapter V., Pathology. All that is now required is,—while admitting that in some instances such an organic condition as plethora, and in others such a state as anæmia, may be productive of convulsions; and further, while admitting that convulsions may, at other times, be the expression of such cachexiæ as tuberculosis, scrofulosis, and the like,—to assert that there are many cases of epilepsy in which such organic conditions cannot be shown to exist. Again, these organic conditions may be carried to an extreme degree without producing epilepsy, and when they coexist with convulsions the general character of the affection differs from that of simple epilepsy.

2nd. Epilepsy is an idiopathic affection, because in many cases eccentric irritation cannot be shown to be the cause of either the first or of subsequent attacks.

For the details of argument in support of this proposition the reader is referred to Chapter III., § i., Etiology; and Chapter V., Pathology.

It is well known that in a large number of cases no eccentric irritation can be found; we have, therefore, no right to assume its presence in these because it is found in others. Again, where convulsions can be shown to depend on eccentric irritation, the course of the disease often differs distinctly from epilepsy. See Chapter VI., Diagnosis.

Epilepsy may, however, be induced by eccentric irritation; but the number of cases in which this occurs is small, and they are to be distinctly separated from those in which simple convulsions have followed such conditions of disturbance.

3rd. Epilepsy is an idiopathic affection, because no structural lesion of the brain or spinal cord has been found constantly associated with it.

Although this fact is immediately admitted by those who have considered the subject, the inference from it, as stated above, has been either withheld or rejected; and, therefore, some authority and comment may be necessary for its support.

In Portal's "Traité de l'Épilepsie" there are related ten examples of epilepsy in which no lesion was discovered in the encephalon, and also eight instances in which no morbid alteration of structure was found anywhere.*

Foville makes the following statement, that "if the nervous system of an epileptic, in whom the attacks are not followed by a persistent disorder of the intellectual and motor faculties, is examined, you find no constant alteration if the patient has died of a disease foreign to the epilepsy . . . Vous ne trouverez rien, absolument rien, qui diffère de l'état normal dans le plus grand nombre des cas de ce genre."†

Dr. Todd distributes "cases of epilepsy in three groups," and in the first of these there is "no lesion" in the brain or spinal cord.‡

Dr. Marshall Hall recognised the frequent existence of epilepsy without organic lesion, which he termed inorganic epilepsy.§

Dr. Graves has detailed minutely the clinical history and *post-mortem* appearances of a case of epilepsy of twenty-one years' duration, in which the brain and spinal cord were "perfectly healthy."‖

But, while facts of this kind have been recognised and admitted by many, the proper inference from them has not been

* Traité de l'Épilepsie, §§ III. and IV., p. 105.

† Dictionnaire de Médecine et de Chirurgie pratiques, art. Épilepsie, p. 419.

‡ *Medical Times and Gazette*, Vol. IX., p. 130.

§ Aperçu du Système spinale, p. 229.

‖ Clinical Lectures on the Practice of Medicine. Second Edition. By Neligan. 1848. Vol. I., p. 527.

drawn. Thus, so late and so able a writer as Dr. Sieveking presents in his analysis of twenty-four cases of epilepsy no less than nine different classes of organic conditions to which the disease is referred, describing under the one name, epilepsy, the following widely different affections :—defective evolution of puberty; defective nutrition; anxiety; anæmia; uræmia; intra-cranial irritation, not organic; intra-cranial irritation, organic; cerebral congestion; scrofulous diathesis; and eccentric irritation.* Dr. Bright's twenty-two cases of epilepsy record only five pure examples of that disease.† Now, it is evident that if some of these deserve the name of epilepsy, others do not; and it is essential for all purposes of analysis that the same word should be made to stand for the same thing. To compare the history of a convulsive affection, which is the expression of the scrofulous diathesis, with that which depends upon a blood-poison, such as uræmia, and these, again, with organic and non-organic intra-cranial irritation, and so on, except for the purpose of discovering, through seeming similarity, their essential difference, cannot be productive of an advance in pathological science. But to group such cases together, call them by one name,—epilepsy,—and then estimate numerically the frequency with which this or the other phenomenon may be present, is to proceed upon so false a method that the science of pathology must be by such means thrown backwards, and into augmented confusion.

If epilepsy can exist without diathetic disease, without blood-poisoning, without violent eccentric irritation, and without organic lesion, then these conditions are not essential to the disease, and when they exist, cause symptoms which are over and above those proper to the epilepsy itself. Such conditions may co-exist with epilepsy proper, but much more rarely than is supposed, the cases in question being then more correctly denominated by another word; but when there is such co-existence, we ought to separate the one element from the other, and the first step in this process is to define as accurately as possible what is included in epilepsy itself. For this purpose I have excluded from a large number of convulsive diseases all

* *Medical Times and Gazette*, 1855, p. 205.

† Reports of Medical Cases, Vol. II.

those cases in which the fits were evidently due to one or more of the several conditions enumerated, retaining under the name of epilepsy only those cases in which there was no reason to believe in the existence of anything beyond an idiopathic affection, characterised by those essential features of the disease already described in the definition.

Hasse has, I think, stated very correctly the relation which central lesions occupy to the disease in question, viz. :—"Es ist also ein Irrthum, das Wesen der Epilepsie in einer gröberen Läsion des Gehirns und seiner Umgebungen zu suchen, eine solche, wenn sie vorhanden ist, wirkt als zufälliges Moment, indem sie, natürlich weit häufiger als entferntere Läsionen, jene feinere Veränderung der Hirnsubstanz hierbeiführt, welche der Epilepsie wesentlich zum Grunde liegt."*

M. Sandras appears to be equally correct when he speaks of central lesions as "la cause prédisposante de l'état épileptique du cerveau ;" † and this, the proper relation of central lesions to the disease in question, has been discussed in the first chapter of this work, and will be more fully considered in the fifth, devoted to Pathology.

* Virchow's Handbuch der Speciellen Pathologie und Therapie, IVte. Band. 1ste. Abth. Krankheiten des Nervenapparates von Hasse, p. 262.

† Traité pratique des Maladies nerveuses, Tome I., p. 210.

CHAPTER III.

SYMPTOMS OF EPILEPSY.

"Symptoms are the signals by which we learn that disease is present; the evidence upon which our whole craft proceeds."—WATSON.

It is desirable to separate the phenomena of the epileptic paroxysm from those which present themselves during the intervals of attack; and they will, therefore, be described in the following order:—

I. Interparoxysmal symptoms.

A. Mental and emotional.

1. Changes in memory and attention.
2. „ apprehension.
3. „ recollection.
4. „ ideation.
5. „ the control of emotion.

B. Sensational, or animal.

1. Cephalalgia.
2. Vertigo.
3. Muscæ, tinnitus aurium, &c.

C. Motorial, or animal.

1. Tremor.
2. Clonic spasm.
3. Tonic spasm.
4. Paralysis.

D. Organic, or vegetal.

1. Nutrition.
2. Temperature.
3. Muscular strength.

E. Relations between A, C, and D.

II. Paroxysmal symptoms.

1. Premonitory of the attaek.
2. Aetual; during the attaek.
 - A. Mental.
 - B. Sensational.
 - C. Motorial.
 - D. Organic.
3. Sueeeeding the attaek.

I. Interparoxysmal Symptoms.

The terms mental, motorial, &e., are employed in the following sections in preference to eerebral, spinal, and the like, inasmueh as they convey no theory with regard to the eausation of symptoms.

The statements which are made in regard of interparoxysmal symptoms do not refer to phenomena immediately either preceding or following the attaeks; but to those which may be detected in the interval, as more or less persistent eonditions.

Whatever view may be taken of the intimate pathology of epilepsy, its eharaeter is sueh that we are led to regard the attaeks as oeeasional expressions of a morbid eondition, which must, at all events to a eertain extent, prevail during the interparoxysmal period. What that eondition is, to what extent it may prevail, and in what manner it is related to the attaeks, are questions to which, I think, as yet no eomplete answers have been given. The statements made by various authors differ widely; we have imperfeet observations, *à priori* speculations, and hasty generalizations; but nothing upon whieh mueh reliaiee can be placed; and I have, therefore, endeavoured to supply this want, by carefully examining numerous cases, and presenting by a numerical analysis the results of such inquiry. Some of these results were laid before the profession in 1854, at a meeting of the Brighton Medieal and Chirurgical Society,* and others were read to the Medical Soeiety of Observation, London, 1858. The latter observations are now for the first time published, and with the consent of that Society.

* On the Interparoxysmal Phenomena of Epileptics.—*Lancet*, 1856.

A. MENTAL CONDITION OF EPILEPTICS DURING THE INTERVALS OF THEIR ATTACKS.

M. Morel makes the following powerful remark:—"Il est dans la nature des maladies nerveuses d'imprimer à l'idiosyncrasie physique et morale des malades un cachet tout-à-fait particulier; et sans que l'on puisse dire, d'une manière absolue, que les élémens qui formaient la base des qualités intellectuelles et morales antérieures des individus ont complètement disparu, on peut, cependant, affirmer sans exagération qu'ils peuvent être groupés d'après les analogies d'un caractère qui finit par leur devenir commun."* This is the condition which we may denominate the "epileptic character," and which has been so termed by M. Morel.

Hasse says in description of this character,—"es tritt mehr und mehr das Thierische in der ganzen Persönlichkeit hervor."† Romberg states, that "it is characteristic to find a loss of memory, and a diminution of the distinctness of ideas, combined with greater irritability of temper."‡

Allowing, however, that such conditions are frequently found in epileptics, we ought to inquire whether they are in reality "characteristic" of the disease:—*i. e.* whether they are necessarily included in the idea of epilepsy, and whether they may exist without epilepsy. Upon this point we find great differences among authors. Esquirol states that four-fifths of the epileptic women in the Salpetrière were insane; and of the one-fifth who were not insane, "toutes ont quelque chose de singulier dans le caractère."§ Other authors speak of mental failure as occurring "in the majority,"‖ and others of the disease "terminating" in such failure.¶ Certain authors say that the mental condition depends upon the severity or the frequency of the attacks;** and others relate cases in which the mental condition was

* Études Cliniques. Traité théorique et pratique des Maladies mentales. Tome II., p. 316.

† Virchow's Handbuch. IVter Band. 1sten Abth., p. 258.

‡ Manual of the Nervous Diseases of Man. Syd. Soc. Translation. Vol. II., p. 203.

§ Des Maladies mentales considerées sous les Rapports médical, hygiénique et médico-légal. Tome I., p. 285.

‖ Foville, Art. cit., p. 416.

¶ Georget. de la Physiologie du Système nerveux, &c. Tome II., p. 385.

** Prichard, Hasse, Foville.

natural; or they make general statements to the effect that it is so in some instances. Thus Maissonneuve details a case of connate epilepsy in a patient ætat. 53, in whom the attacks recurred every month or fortnight, in whom the convulsions were strong; and yet he affirms, "hors des accès elle jouit de toute sa raison, et d'une assez bonne santé."* And Heberden makes the following remark, the truthfulness of which is confirmed by history, and by the experience of many:—"Itaque nonnullis contigit esse tam felicibus, ut, quanquam epilepsia implicari cœperint, dum pueri essent, et crebris deinde accessionibus vexati sint, ad summa tama reipublicæ munia, summosque honores, propter eximias ingenii dotes evecti fuerint."†

As it is evident that the questions relating to the mental conditions of epileptics cannot be answered by a reference to authorities, nor by contemplating profoundly the intellectual state of a few striking examples, I have carefully examined the question in many of the cases which have fallen under my own notice, and will proceed now to furnish the results.

Irrespective of hereditary taint, supposed cause, age at commencement, severity of seizures, frequency of their recurrence, duration of the disease, and age at the time of observation, what is the actual mental condition of epileptics during the intervals of their attacks?‡

In order to answer this question I have divided epileptics into four classes. In the *first* there are placed those in whom neither by the patients themselves, by their friends, nor by myself, could there be detected any deviation from mental health. In other words, the individuals who form the first class presented no change in their mental capacity from that which they exhibited prior to the development of the disease, and exhibited, for their station in life and educational advantages, the full average of intellectual vigour and cultivation.

The *second* class consists of those who presented that slight defect of memory which is limited to the occurrence of recent and trifling events, the memory for events long since passed

* Recherches et Observations, ant. cit., p. 58.

† Commentarii de morborum historia et curatione, p. 125.

‡ For the several conditions enumerated in the text, and for their relation to the mental state, see Chap. IV., § iii.

being intact. In those who formed this group, such impairment of memory was the only departure from health.

This is not the place to discuss the nature of this phenomenon, which has been described by Dr. Prichard;* such discussion will be found in Chap. V., Pathology: but, in the meantime, it is convenient to denominate this group by the words, "power of attention diminished," or "defective attention;" and I think it will appear hereafter that this is the real nature of the defect.

In the *third* class are those cases which present, in addition to the defective attention or loss of memory, diminution of the faculty of apprehension. These patients are dull in acquiring new ideas, often take erroneous and confused impressions, and exhibit the defect of memory already alluded to in a greater degree.

It is convenient to denominate this group by the words "apprehension defective."

The *fourth* class includes those who present the special features of the second and third classes, but to a higher degree, and who exhibit also more or less confusion of ideas. Individuals of this group can only with difficulty be made to understand; they constantly misinterpret, and forget what is told them. They reason very little, and that little often incorrectly; they are often stupid, idle, and indifferent, and, though not technically nor legally insane, require more or less constant supervision.

From the prominent character of this group it may be described as that of "defective ideation."

From the following analysis I have excluded all cases of positive insanity; of general organic disease; of distinct cerebral disease, where, although there may have been convulsions, there was not prominently a case of epilepsy; and all instances of simple eccentric convulsions.

After having tabulated the residual cases of epilepsy proper, I find sixty-two in whom the mental condition has been carefully described. Those in whom there was no mental change form the first class; those in whom one or the other of the three faculties was deficient constitute class the second; those in whom two were defective the third; and those in whom deterioration was found in all the three constitute the fourth class.

* Lib. of Practical Med., Vol. II., p. 108.

These classes exhibit the following numerical relations :—

Mental Class.	Males.	Females.	Total.	Per centage.
First ...	16	8	24	38·70
Second ...	10	10	20	32·25
Third ...	4	5	9	14·51
Fourth ...	4	5	9	14·51
	34	28	62	99·97

From this it appears that 38 per cent. of epileptics are free from any mental failure, that number presenting a full average amount of intellectual capacity and information. There is not, therefore, any special mental condition necessarily involved in the idea of epilepsy ; or, in other words, the disease both may and does exist in more than one-third of its victims without causing any change in their intellectual power or condition.

It appears, however, that in nearly two-thirds of the cases of epilepsy the mind exhibits failure, but that of the number so affected, viz. 61 per cent., rather more than half, viz. 32 per ecnt., were affected only to a slight degree ; while a notable degree of mental incapacity existed in but one-seventh of the total number of cases, *i. e.* in nine cases, or 14·5 per cent.

Thus, then, although it is more common to find some mental deterioration than perfect intellectual health, a division of epileptics into four groups, separated from each other by the degree of their mental failure, shows that of these groups the first contains the largest number of cases, the second the next largest, and the third and fourth each a much smaller number. It is evident, therefore, that a slight degree of mental failure is more frequently found than a higher degree.

Certain sexual differences may be observed in the above table, and they are, in general terms, these, that in the female sex the mind suffers more frequently than in the male, and that this difference is greater in respect of the higher degrees of mental failure than of the lower.

Thus the number of females to males was as 28 to 34 ; but in the first class there are relatively fewer females than males. In the second class the numbers are absolutely the same ; but as the whole number of females examined is smaller than that of males,

the second class contains relatively a larger number of females. In the third and fourth classes the number of females is absolutely larger than of males, and, therefore, relatively to the number examined, the disproportion is very great.

The faculties of memory and apprehension have been examined more minutely in a certain number of cases, for the purpose of ascertaining the frequency with which they are affected to different degrees in each sex respectively. The following table will exhibit the condition of memory in fifty-seven cases, comprising thirty-three males and twenty-four females :—

Condition of Memory.	Males.	Females.	Total.		Per centage.
Normal	14 ...	8 ...	22		
Defective, but only immediately after the fits	2 ...	1 ...	3	25 ...	43·85
Defective, but slightly and partially ...	2 ...	2 ...	4		
Defective, but generally, though slightly ...	9 ...	9 ...	18	32 ...	56·14
Defective, generally and to great degree ...	6 ...	4 ...	10		
	33	24	57	57	99·99

In judging of the interparoxysmal condition of epilepties, it is but right, I think, that those cases in which the memory was defective only immediately after the attacks should be grouped with those who presented no defect.

By "partially defective" I intend a deficiency of memory for certain classes of ideas or words, such as the forgetfulness of names or places, other ideas or facts being retained. By "generally defective" is meant a loss of memory with regard to all kinds of ideas or facts. The other terms employed are sufficiently comprehensible.

It appears, from the above table, that it is more common to find a defective than a normal memory, and this in the ratio of thirty-two to twenty-five. Further, that when memory is defective its most frequent condition is that of slight but general impairment, its least common state that of partial or limited deterioration; and, between the two, is the higher degree of failure.

The sexual differences which are represented by the above table are to the effect that a relatively larger number of females than of males present impairment of memory; for example, 15 of 24 females, and 17 of 33 males, being respectively ·62 and ·51 per cent., giving a mean of ·56 per cent. for the two sexes when added together.

Examining the faculty of apprehension in the same manner, the results may be tabulated thus:—

Condition of Apprehension.	Males.	Females.	Total.		Per centage.
Normal	17 ...	12 ...	29	30 ...	62·5
Defective, but only immediately after the fits	1 ...	0 ...	1		
Defective, but slightly and partially	1 ...	1 ...	2	18 ...	37·5
Defective, generally though slightly	4 ...	5 ...	9		
Extremely defective	4 ...	3 ...	7		
	27	21	48	48	100

From this table it appears that it is much more common to find the faculty of apprehension unaffected than impaired, and that of the two sexes respectively a larger relative number of females than of males exhibit this mental failure.

Epileptics, therefore, are more prone to exhibit defect of memory than of apprehension, in the ratio of ·56 to ·37; but there are very many who exhibit no intellectual impairment at all. We cannot regard the existence of either one or both of these defects, common as they are in epileptics, as characteristic of their disease; and further, deficient memory and impaired apprehension may be found in many conditions having no relation to epilepsy.

If these two changes, which are by far the most common in epileptics, occur only in such proportion of cases that they cannot be regarded as essential to the disease; *à fortiori*, that further change of ideation, which is found in only ·14 per cent. of the whole number, cannot be justly considered as characteristic. Its presence is the exception, and not the rule; and, therefore, whether its features are peculiar or not, they do not form an integral part of the disease called epilepsy.

With regard to the emotional condition of epileptics I have definite information in twenty-six cases of sixty-nine. In the remaining cases there was nothing abnormal which I could either observe in the patients themselves, or ascertain from their friends.

The most frequently observed condition was, in the male sex, a combination of timidity and irritability, with depression of spirits; and in the female sex, a simple excitability of temper and want of emotional control. In the male sex, habitual depression of spirits is noted in 7 of 15 cases, and cheerfulness is described in one case only; whereas in the female sex, good spirits and cheerfulness are noted in 4 of 11 cases, and habitual depression in none. Excitability and deficient control of emotion were found in 6 males and 8 females. Timidity is noted in 6 males, but not in one female.

Conclusions.—

1st. That epilepsy does not necessarily involve any mental change.

2nd. That considerable intellectual impairment exists in some cases; but that it is the exception, and not the rule.

3rd. That women suffer more frequently and more severely than men.

4th. That the commonest failure is loss of memory, and that this, if regarded in all degrees, is more frequent than integrity of that faculty.

5th. That apprehension is more often found preserved than injured.

6th. That ulterior mental changes are rare.

7th. That depression of spirits and timidity are common in the male sex, but not in the female; that excitability of temper is found in both.

If, instead of regarding these simply numerical relations, we endeavour to form a distinct picture of the mental condition of epileptics, we must divide them into three groups, formed, as all groups are, around ideal types, the particular cases in each of these groups not corresponding accurately in all their features to the types in question, but presenting such a similarity that the classification may be readily effected.

In the first group there are those cases in which no mental alteration is discoverable, and this group, so far as my own

experience extends, equals ·38 per cent. of the whole number. Of course, *quoad* mental condition, there is nothing to describe.

The second group consists of those in whom the mind has undergone deterioration, but in whom there is no marked emotional change. Such patients are silly and childish in their manners; they are easily pleased, and as easily depressed or vexed; they have little or no energy of purpose; cannot be made to pay earnest or prolonged attention to anything; they are forgetful, and dull of apprehension; give very unmeaning accounts of their sensations; think little; use their judgment still less, and are determined in their actions by trivial causes; unaccountable feelings, or, as often happens, by nothing which they are able to assign. These patients often pass hours in idleness or silence, appear to care for nothing, and hope for nothing, and are willing to surrender themselves entirely to the guidance of others in whom they may have some confidence, or to whom they are attached. For illustrations of this group see Cases VIII. and IX.

The special features of those cases which constitute the third group consist in the combination of a mental condition very similar to that found in the second, with a different habit of emotion. Intellectually these patients are deficient in regard of attention, apprehension, ideation, and recollection; their judgment is weak, and often erroneous; and emotionally they are either indifferent and stolid, or morose and suspicious. They are obstinate and intractable; but this appears generally the result of distrust of others rather than of confidence in their own judgment or intentions.

Of the first group of cases the following may be quoted as examples:—

Case I.—*No hereditary predisposition to epilepsy; convulsions in infancy, until æt.* 2; *recommenced, æt.* 15; *and eight fits occurred at lengthened but diminishing intervals, during a period of three years. A year later frequent occurrence of attacks of clonic spasm, during a period of three weeks. Mental condition unimpaired; no interparoxysmal excess of motility; general health good. Recovery: no fit for now nearly seven years.*

§ I. A. B., male; æt. 18, in December, 1852.

Has always been small of size, and diminutive in stature, of childish manner, and peculiar, somewhat silly expression of face. This is owing to half-open condition of eyelids, with, if the term may be used, a chronic smile.

Mentally considered, he is belied by his "exterior semblance;" for his capacity is good, his industry remarkable, his attainments considerable, and he is, in his modes of thinking and in his general habits, in advance of, rather than behind others of his own age.

§ II. A. Has lived principally in London, has been at school since very young, and is now a junior usher, or pupil teacher in a boys' school. Has been fed well, and clothed well; has taken a considerable amount of exercise, and has been a hard student.

B. When three weeks old had many convulsions of "most alarming nature;" and from this time until he was two years of age, the fits were repeated at intervals of two or three months. From 1836 to 1849, *i. e.* from two years of age until fifteen years, no attacks of convulsion.

In 1844, A. B. (æt. 10 years) suffered from "inflammation of the chest;" for which he was ordered venesection and leeches. He was ill for six months; and afterwards, for a long time, felt shortness of breath and giddiness upon exertion, but the latter was not severe enough to make him fall. He has no winter-cough, and has not, of late, suffered in any way from the chest.

C. Nothing definite known of sexual condition; but general character known to be highly moral; and disposition religious.

D. Father died of erysipelas; mother is still living; and he has two brothers, who are in good health. In none of his antecedent relatives has any convulsive affection been known; nor in the collateral. This record was made in 1852; but in 1854 an elder brother of A. B. was affected with acute mania; was for many months in a lunatic asylum, but left it perfectly restored in health; and has been now (1859), for more than two years, in an extremely satisfactory state as regards both body and mind. The attack in A. B.'s brother followed a prolonged and intense strain of mind to work for an examination at the University of London, in the leisure hours which he had between giving lessons to different young gentlemen of whom he was

the private tutor. Since his recovery, A. B.'s brother has graduated in the London University, and has resumed his tutorial duties; he is in apparent health; but there is a peculiarity not easily to be described in his manner.

§ III. A. First convulsive attack occurred on April 7th, 1849, A. B. being then fifteen years of age. On the evening of the sixth, the boy had eaten freely of new buns; and in the morning of the seventh, while he was lying asleep, some of his schoolfellows amused themselves by tickling the soles of his feet; and although this tickling did not awaken him, the fit occurred during the process.

C. A second fit took place on March 9th, 1851, immediately after having received a blow on the stomach. The third attack was on April 3rd, while playing "fives;" the fourth on April 24th. During Midsummer holidays he lost all use of his legs for three days. The fifth fit was on December 15th, when startled by the noise of some boys playing. On April 5th, 1852, the sixth fit occurred, after great fatigue in travelling. On the 8th of the same month, a seventh fit was apparently brought on by noise, and fatigue of sliding. On November 22nd, after eating freely of water-cresses, he "turned pale and fainted;" this so-called fainting being, in all probability, an eighth attack of epilepsy.

December 7th, 1852.—§ IV. A. Thin and diminutive, but of considerable strength; somewhat silly and childish expression of countenance; of dark complexion, and hazel eyes.

B. Pale in regard of colour on cheeks. Temperature of head and of hands warm. Sebaceous follicles prominent on forehead and cheeks.

D. Subject to diarrhœa; appetite good.

E. Occasional shortness of breath in walking.

K. Head well formed; forehead rather prominent, and raised: temperature equals that of rest of body. Is subject to frequent and severe headache; the pain, however, being almost invariably relieved by a single dose of bicarbonate of potass.

In intellect A. B. is decidedly beyond his years; but he is of nervous and apprehensive temperament with regard to his own health, and is very easily depressed in spirits by any

unfavourable view of that matter. His power of application is good, apprehension also; but memory is not strikingly good; there is, however, no definite damage done to the latter.

When writing, his fingers often "double up" spasmodically; he is restless at night, and generally throws the clothes from off him during sleep; he is, however, not aware of starting in his sleep, or at other times; there is no tremor of the muscles, nor clonic spasm, while under observation.

M. Nothing unnatural in the organs of special sense.

§ V. B. Extreme caution in diet.

E. ℞. Pulv. rhei., magnes. carb., potass. bicarb., aa ℈j. aquæ f. ʒiss.
Fiat haustus, omni nocte, sumendus.

January 11*th*, 1853.—§ IV. K. No headache; no attack; no threatening.

§ V. Pergat.

February 14*th*.—§ IV. D. Diarrhœa again of late; and

K. Complains of a thrilling sensation occurring frequently, *i. e.* three or four times in an hour, in the hands and legs, and coming on generally while sitting. During this time the hands and legs are powerless; he lets objects fall out of the former, and feels the latter "give under" him. At the same time he feels giddy, and his breath is short; the right hand is drawn up; and when the thrilling sensation occurs, as it sometimes does, in the neck, the head is drawn down to the right side. There is, with the thrilling sensation, a "cramp-like pain."

§ V. E. ℞. Tincturæ hyoscyami, ♏xx.
Potassæ bicarbonatis, ℈j.
Spiritus ammoniæ aromaticæ, ♏xxv.
Misturæ camphoræ, f. ʒiss.
M. Fiat haustus ter die, vel pro re nata sumendus.
Pergat in usu misturæ aperientis.

July 18*th*.—§ IV. A. Found almost immediate relief after taking above medicine. Aspect is that of health; manner cheerful; in better physical condition.

C. Strength good.

D. Appetite good; tongue a little furred; but not tremulous when protruded.

K. In good spirits; feels well; sleeps well. Has no tremulousness of hands; no clonic spasm; no cramp; and no

thrilling sensations. Only complaint is occasional headache, with heaviness at the stomaeh.

§ V. E. Pilulæ alöes c. sapone, gr. iv., omni nocte sumenda.

A. B. eontinued taking the pills for some months; but since that time he has discontinued medicine altogether. It is now (1859) nearly seven years since any attack has occurred; but during the whole of that period A. B. has frequently ealled upon me to assure me of his continued health. He is actively engaged as usher in a large school, and he bears the fatigues and vexations of that office without complaint or apparent injury.

Notabilia.—I. Hereditary predisposition to nervous disease was probably present in A. B.; for this is more likely than that such disorder should have originated spontaneously in two brothers—and yet he recovered.

II. The convulsions of infancy,—their ceasing when we may suppose the first dentition to have been accomplished,—their recommencement during the age at which puberty would commence, and their second cessation at a time when puberty may be considered to have been established, are facts which may be held to indicate the manner in which the convulsive diathesis was brought about in A. B. It was, probably, nothing more than an exaggeration of that normal increase of nervous mobility which attends those two periods of augmented nutritive activity. Dr. West says truly, dentition "is a time of most aetive development of the organism,—a time of transition from one mode of being to another, in respect of all those important funetions by whose due performance the body is nourished and built up."* At a later period, when A. B. was ten years of age, the attack of pneumonia or pleurisy was not ushered in by convulsion; the special proclivity to that form of disturbance had passed away.

III. Van Swieten relates the following fact:—"I have seen a very healthy girl, ten years of age, ... rendered epileptie for several years; and the first time, she was seized upon having her soles tickled by some girls who were playing with her, some of them holding her fast upon the floor, to prevent her avoiding

* Lectures on Diseases of Infancy and Childhood, 1848, p. 344.

that intolerable sensation."* Esquirol refers to a similar case.† Van Swieten's case and that of A. B. are interesting examples of one mode of the immediate causation of convulsions, viz., the passage of normal or abnormal involuntary movements into the attack.‡ We have other illustrations of the same mode of induction, *e. g.* in the case of paroxysms occurring during or immediately after coition§ or masturbation;‖ during violent effort, as in straining to raise a heavy weight; and also in the passage of an attack of pertussis into a complete convulsion with loss of consciousness. Hovius says, "Sternutatio, quæ est proximus ep[æ] affectus et hominem in periculum convulsionis epilepticæ conjicit."¶ Gabucinus has the following: "Quamobrem meo quidem animo usus invaluit ut quum quis sternuit, ei salutem dicamus, perinde ac si timeamus ne comitiale malum incidat, cui affine sternutamentum maxime esse ostensum est."**

IV. The "thrilling sensations," &c., were doubtless clonic spasms, which affected the flexors of the arm more forcibly than the extensors, and one side of the neck more powerfully than the other. They resemble abortive epileptic seizures; the spasmodic element being present, but the mental disturbances amounting simply to vertigo.

Case II.—*Male, æt.* 21; *no hereditary predisposition; no infantile convulsions; first attack without apparent cause, at twenty years of age; average frequency of fits,—one in three weeks; E. mitior, more frequently; time since first attack,—one year. Mind unimpaired; motility but slightly disturbed; general health good. Fits diminished in severity, and subsequently disappeared altogether.*

§ I. C. D. Male, æt. 21, in December, 1852.

§ II. A. Born in London; is by occupation a tailor; has plentiful food and clothing; is remarkably cleanly in habits and appearance.

* Commentaries on Boerhaave, Vol. X., p. 147.
† Maladies Mentales, Tome I., p. 300.
‡ *Vide* Chap. V., Pathology.
§ See Case IV., also Esquirol, "Maladies Mentales," Tome I., p. 300.
‖ Esquirol, *Ibid.*, Tome I., p. 300.
¶ Dissertatio medica inauguralis de Epilepsia, p. 7.
** De Comitiali Morbo, p. 44.

B. Previous general health has been exceedingly good; had no convulsions during dentition.

C. Single; no evidence, nor suspicion of sexual excesses.

D. Father died a long time ago, of what C. D. terms "scrofula;" mother is still living, æt. forty-seven. He has six brothers, and one sister; they are all in good health. No member of the family ever had any fits.

§ III. A. First fit occurred at age of twenty, in the winter of 1851. C. D. had been out for a long time, and when he came home to the house, he fell down in a fit. He could not account for the attack, but says that his bowels were habitually constipated at that time. Otherwise he was, so far as he knows, in perfect health and strength.

D. A second attack occurred about three months after the first; and from that time until the present, December 14th, 1852, he has had an attack of ep. gravior every three weeks, and attacks of ep. mitior more frequently; the latter occurring two or three times a day, but occasionally being absent for a week. Sometimes considerable mental depression before an attack. Used to pass urine in sleep; does not think this was connected with fits.

§ IV. *December 14th*, 1852.—A. Appearance is that of perfect health; patient is of ruddy complexion; is well developed; has considerable muscular strength; and is habitually in good spirits; feeling well, and performing his various avocations without discomfort.

B. Colour of face and extremities (upper) good; but says that hands and feet are always cold.

C. Muscles well developed and firm; gait natural.

D. Bowels now regulated by saline aperients; appetite good; no trouble from digestion.

K. *Paroxysmal phenomena.*—In the severer fits he becomes dark in the face, and the neck is much swollen. In the lesser attacks, which occur sometimes three or four times in the day, and sometimes only once a week, there is nothing to be seen, for he merely "loses himself" for a few seconds. These little attacks are very prone to occur at dinner time. For the last three or four months,—since taking an antacid aperient every night, and thus regulating the bowels,—the fits, although main-

taining their previous rate of frequency, have been much less severe.

Interparoxysmal condition.—Between the fits, C. D. "feels perfectly well." His mental power and information appear rather above than below what is common to persons in his social position. His apprehension is quick, and correct; his memory is good; he expresses himself with facility. Just before a fit, he feels "dizzy," and this may last for a few minutes to a whole day: under the same circumstances, he sometimes shivers, feels "nervous," and trembles at any sudden noise. There is no clonic spasm, but occasional starting when just about to fall asleep.

§ V. E. Is taking an aperient every night.

℞. Zinci oxydi, gr. v.
Fiat pulvis ter die sumendus.

§ IV. *February 24th*, 1853.—A. Is now suffering from a "cold," and feels generally ill, and depressed; eyes suffused.

D. Tongue dry, with yellow fur.

K. A fortnight ago had a fit; to-day is in low spirits; hands tremulous, slightly; limbs feel heavy to himself.

§ V. E. Continue the aperient, and the oxide of zinc.

℞. Potassæ bicarbonatis, ℈j. Aquæ, f. ℥j.
Spiritus ammoniæ aromaticæ, ♏xx.
Tincturæ hyoscyami, ♏xx.
Misce, et fiat haustus, pro re nata sumendus, præsertim urgenti vertigine.

§ III. *March 31st.*—C. Had an attack a fortnight ago, this occurring after a period of thirty-five days from the one which preceded it. C. D. could not assign any cause for its occurrence. It came on at night; directly he lay down he felt giddy, *i. e.* "as if he was about to fall," but there was, at the same time, no apparent movement of objects; they did not seem to turn round; and he had no cephalalgia; neither had he suffered from it during the day. In the attack, the tongue was bitten severely, and he felt "very poorly" for the whole of the following day.

A week ago,—*i. e.* seven days after the attack just referred to,—C. D. felt poorly, and thought a fit was coming on; but he took the draught prescribed on February 24th, and the feelings disappeared.

§ IV. A. Face of good colour; hands feel warm and moist, but the skin on the back of the hand is rough and scaly. *Temperature* of room, 61·5° Fahr.; of right hand, 92·5°; of neck, 94·5°. Difference between trunk and extremity, 2° Fahr.

D. Tongue pale, with thin white fur, through which small papillæ project. Voice rather thick.

§ III. *June 16th.*—C. Has been quite well until the last three or four days, during which time he has occasionally felt as if a fit were coming on, and as if he were about to fall; but these feelings have left him after taking the alkaline draught.

§ IV. A. To-day is better; but

D. Tongue is coated with yellow fur in the middle.

§ V. E. Pilulæ hydrargyri, gr. iv., horâ somni sumenda.

§ III. *June 30th.*—C. On the night of the 28th threatened with an attack; but it passed away. Tongue cleaner, but still a little yellow.

Postscriptum.—After the observations above recorded, C. D. continued free from attacks; but he frequently called at my house to assure me of his health. The oxide of zinc was taken for some weeks after June 30th, and was then, gradually, discontinued.

Notabilia I.—That the general health of C. D. was, throughout the period of his seizures, and prior to the time of their first occurrence, remarkably good. He was in rude health; and the attacks, neither at their onset, nor upon the occasions of their subsequent recurrence, could be referred to any distinctly operative cause.

II. That, notwithstanding this apparent causelessness, attacks were occasionally averted by the administration of alkaline draughts, the *modus operandi* of which is not easily perceived.

II. That the vertiginous sensations to which C. D. was subject were of that kind in which the motor illusion is referred to the individual's own person, and not to the surrounding objects.

IV. That the attacks, after diminishing in severity, eventually disappeared altogether.

B. Sensational condition of Epileptics during the intervals of their attacks.

Cephalalgia.—Dr. Sieveking states that cephalalgia was

present in 63 to 66 per cent. of epileptics;* but it has been by no means a prominent symptom in so large a proportion of the cases which have fallen under my own observation. Thus in 72 cases, it has been noted only 26 times; or in 36 per cent.: and although I am not perfectly certain that in all of the other 46 cephalalgia never occurred, I am convinced that it was, if present in any of them, an unfrequent and trivial event.

As, however, in some of these 46 cases it is positively asserted that no headache existed, I exclude from the following table all instances in which there is not a definite statement on the question, and thus the cases are reduced in number to 34.

Cephalalgia.		Males.		Females.		Total.		Per centage.
Absent		7	..	1	...	8	...	23·5
Present	Occasional ...	6	11	11	15	17	26	76·4
	Frequent ...	5		4		9		
		18		16		34		99·9

From this it would appear that cephalalgia occurs in 76 per cent., a larger per-centage than that given by Dr. Sieveking's cases. It also appears that women are the subjects of headache more frequently than men, in the ratio of 93 to 61 per cent.; but although in each sex, considered by itself, headache is more frequently observed to be a rare than a common occurrence, there is the following sexual difference: viz., that of those in whom cephalalgia is present, the male sex suffers from it more "frequently" than the female; whereas in the latter it is in a larger number an "occasional" event. Thus, of the males suffering from cephalalgia it was "frequent" in 45 per cent., and of the females in only 26 per cent.; and *vice versâ*, it was "occasional" in 54 per cent. of males, and in 73 per cent. of females.

As to the relation which cephalalgia occupies to epilepsy there is little to be gathered from the preceding facts that is of more than negative character. So many individuals not epileptic are the subjects of headache that the "occasional" presentation of this symptom in an epileptic cannot be regarded as necessarily

* Medico-Chir. Transactions, Vol. XL., 1847, p. 161. Epilepsy and Epileptiform Seizures, their Causes, Pathology, and Treatment, p. 46.

due to that disease. Excluding, therefore, those in whom headache was merely an "occasional" event, we find only 26 per cent. in whom it occurred; and if we regard the number in whom it was a "frequent" occurrence in relation to the whole of the cases,—and it is quite certain that this is a correct method to employ, inasmuch as the symptom, if present in the doubtful cases, was of so trifling a character as to escape notice both by the patients, their friends, and myself,—we find that headache is a notable symptom in but 9 of 72 cases, viz. 12·5 per cent.

Vertigo.—With regard to this symptom, the observations I have made upon cephalalgia are applicable. In numerous cases I have omitted to record its absence; but at the same time I am fully convinced that it was absent in those cases where no mention is made of the symptom. However, in order to separate impressions—no matter how distinct they may be to myself—from ascertained facts, I separate the two groups of cases, and give the results in the following table:—

Vertigo.		Males.		Females.		Total.		Per centage.	
Doubtful		20	25	22	23	42	48	60	68
Absent		5		1		6		8	
Present	Occasional	10	11	6	10	16	21	23	30
	Frequent	1		4		5		7	
		36		33		69		98	

It appears from the above that vertigo is a frequent event in but 5 of 69 cases, or 7 per cent. But if we exclude from the analysis all those individuals with regard to whom there may be doubt, we find that vertigo occurs in 21 of 27 cases, or 77 per cent., and that it is a frequent symptom in 5 of 27 cases, or 18 per cent.

Considered without regard to the frequency of its occurrence in those who are subject to vertigo, it appears that a larger relative number of females than of males present the phenomenon, the ratio being as 90 to 68. And further, it differs from cephalalgia in this, that whereas in the male sex it is, when present at all, only "occasionally" present in by far the larger

number, viz. 10 of 11 cases, it is in the female sex observed to be "frequent" in a relatively large number, viz. 4 of 10.

The vertiginous sensation now referred to is distinctly interparoxysmal, and, so far as such facts can be ascertained, uncomplicated with any spasmodic contractions. In this place, therefore, I am not speaking of those attacks of vertigo, or "vertiges épileptiformes," which are in reality seizures of "le petit mal," but of certain casual sensations which may be dependent upon the spasmodic element of the disease, but at present are not shown to be so related.

With regard to the special character of this sensation when occurring in epileptics, it must be observed that vertigo is one of those sensations which it is by no means easy to describe, that many epileptics are peculiarly deficient and confused in their descriptions of anything, and that this deficiency reaches its extreme with regard to their own sensations. I have consequently found it absolutely impossible, in some instances, where individuals have complained of giddiness, to obtain any description of what they felt, and this even when suggesting comparisons for the purpose of assisting them.

The character of the vertigo when, however, the patients have been able to describe it, has, so far as my own experience extends, been without exception "subjective," *i. e.* the patient feels as if he were moving, and not as if external objects were in motion. The kind of motion which is most commonly felt to be present is that of falling or floating away to the side. I have never known an epileptic say that he felt as if spinning round, or that the room appeared to him as if moving, whereas in organic disease of the brain the former is common, and in sympathetic nervous disturbance, from eccentric irritation, the latter is frequently observed.

Sometimes the vertigo of epilepties occurs without assignable cause; but it has been more common for me to find it referred to movement of the body, the patient asserting that some particular motion or attitude occasioned it.

The vertiginous sensation is not relieved by closing the eyes or shutting out external impressions, as is often the case in organic cerebral disease, but it is removed by fixing the gaze upon some stationary object, or by grasping something firmly

with the hand. This last proceeding is not simply an instinctive effort to maintain equilibrium by grasping an object for support, for the patient feels vertigo when sitting or even lying down, and relieves it in that position in the way described; but its object is, as I understand it, to correct by a new impression from without the erroneous sensation from within. In this case the muscular sense experiences an illusion, and the illusion is removed by a powerful impression. The patient corrects by external impression the erroneous subjective sensation.*

Sense of Sight.—It has not occurred to me to find among epileptics any constant or special alteration of this sense. Seven individuals, four males and three females, have complained of muscæ volitantes, and the following has been the condition of the pupil in twenty-three cases :—

Condition of Pupils.	Males.	Females.	Total.
Small	2 ...	3 ...	5
Medium	2 ...	2 ...	4
Dilated	9 ...	5 ...	14
	13	10	23

These numbers are too small for any other purpose than that of simply showing that a dilated condition of the pupil is more common than either a contracted pupil or one of medium size. The most important fact is that, as in a certain number of cases, 5 of 23, there was contraction of the iris, this condition is not incompatible with epilepsy.

Dr. Radcliffe speaks of the "dilated and sluggish pupil" of epileptics as confirmatory of the view he has taken of that disease;† but this condition is not present in 9 of 23 cases, and it was absent in one-half of the women examined, viz. 5 of 10 cases.

Sense of Hearing.—Tinnitus aurium is a somewhat common phenomenon among epileptics; being present in rather more than half of the cases where inquiry was made upon the subject.

Senses of Taste, Smell, Touch.—As exceptional events,

* *Vide* Vertigo, a paper read at the North London Medical Society by the author of this work.

† Epilepsy and other Convulsive Affections, p. 168.

we find individuals complaining of anomalous sensations which they may compare to tastes, odours, creepings, &c.; but there are none of them which occur with special frequency in epilepsy; and they may be, therefore, disregarded.

Conclusions.—1. That severe headache is an exceptional phenomenon; but that slight and occasional headache is common.

2. That women are more liable to it than are men.

3. That vertigo is also rare; but that it also is less rare in the female than in the male sex.

4. That it is of the kind which has been termed "subjective."

5. That affections of the special senses present nothing characteristic.

6. That dilatation of the pupil is rather more common than contraction to a medium or considerable degree; but that the two latter degrees are frequently observed in epileptics.

C. Motorial condition of Epileptics during the intervals of their attacks.

Among the more remote phenomena of epilepsy, Heberden places "jactitation." Thus, he says, "Signa epilepsiæ remotiora sunt jactitatio," et cætera. And it has appeared to myself that by far the most common phenomena occurring during the interparoxysmal period, belong to the category of involuntary movements.

There are three forms in which motility exhibits departure from the condition of health; viz., tremor, clonic spasm, and tonic spasm. One, two, or three of these forms may be present in an individual, and with greater or less frequency; whereas there are some individuals in whom I have been unable to prove the existence of either. It is necessary, however, to observe in regard of the latter, that in addition to the ordinarily unsatisfactory evidence of a negative, there is positive evidence that such phenomena may occur without the patient's knowledge; and that, therefore, the statement that motor phenomena are absent, must be received with more than usual caution. Patients frequently deny the existence of both

* Commentarii de Morborum Historia, p. 123.

tremor and clonic spasm; and yet the physician may, even while they are making the assertion, observe notable tremor, and such extensive clonic spasm, that the case resembles slight chorea.

We may divide epileptics into four groups, according to the degree of disturbance they present in regard of motility. The *first* group consists of those in whom there is no evidence of either form of muscular action, and in whom the absence of one, two, or of all three forms of disturbance is positively noted. The *second* group is formed of those who present one of the phenomena, and one only; this being either tremor, or clonic, or tonic spasm. The *third* group consists of those in whom two of the phenomena existed in combination; and the *fourth*, of those in whom all three classes of disturbance were present. The numerical relations of these groups are as follows:—Of 69 cases, I have definite information in 57, viz. 31 males and 26 females. As there is some doubt, owing to different causes, with regard to the remaining 12 cases, I exclude them from the analysis.

Class in regard of Motility.	Males.	Females.	Total.	Per centage.
1st. No known motor phenomena	7	8	15	26·3
2nd. One of either tremor, or clonic, or tonic spasm ...	13	13	26	45·6
3rd. Two of the above in combination	7	5	12	21·0
4th. Three ditto	4	0	4	7·0
	31	26	57	99·9

From this table it appears that nearly three-fourths of the whole number of epileptics exhibit some form of motor disturbance during the intervals of their attacks. And it must be remembered that in the one-fourth who constitute the first group, the evidence is not absolutely good with regard to all; *i. e.* in some cases, for example, no mention is made of either tremor or tonic spasm, but it is positively asserted that no clonic spasm existed. If regard is paid to the number in whom it is definitely asserted, with regard to each class of motor disturbance, that it did not exist, I find but four cases, viz. one

male and three females, in whom this evidence exists. In the eleven cases which remain in class the first, therefore, there is not satisfactory proof of the absence of these phenomena: and for the reasons already assigned, I think it probable that the number of epilepties who present motor disturbance, although demonstrably only 73·6 per cent., would be found much larger if we could observe them accurately at all periods of their history. If we form the first group of those in whom it is positively asserted, with regard to each separately, that no one of these motor phenomena existed, we have but the four cases already mentioned, leaving 93 per cent. who exhibited disturbances of motility. And I am of opinion that, if the examination could be made as thoroughly in all cases as it can be in some, there would be found no exception to the rule of motor disturbance.

The degree to which involuntary muscular contractions occur, may be approximatively estimated by the foregoing table. It would appear that, common as motor disturbances are, the combination of them in their three forms is rare; and that it is much more common to find one existing by itself, than to find two co-existing.

The only prominent sexual difference which appears in the above table is the greater proclivity of the male sex, not only to motor disturbances generally, but to the combination of such disturbances especially. For whereas there are eight females and seven males in the first class, there are no females in the fourth, but there are four males.

Before entering upon a discussion of the relative frequency of these several forms of motor disturbance, it will be well to describe more minutely what is meant by each of them.

Tremor.—It is exceedingly common to observe that the hand of the epileptic shakes; that he is tremulous, and as he says "nervous;" but the degree to which this phenomenon occurs varies much. It may be that only when startled by emotional disturbances, or deranged in digestive functions, that this tremor exists; but it may be in other cases, that tremulousness is the habitual condition, and that upon any additional disturbance there are actual rigors; and between these two extremes, there are different degrees, which we may term "medium."

Clonic Spasm exists in very different degrees of severity, and it is frequently denied to be present even when the physician may either see it in the movements of the limbs, or may feel it in the muscles when he grasps the limbs. Slight jerking contraction of a few muscles, or actual choreiform movements of the whole body, may exist; both the former and the latter are commonly quite beyond any volitional control, and are unattended by sensation. They occur also, and often to a more marked degree during sleep than when the patient is awake; but, so far as I have observed in simple epilepsy, they are irregular in time of appearance, and variable in the portions of the body they affect. They thus differ from the spasmodic movements observed in chronic meningitis, and other lesions of the nervous centres.

Sometimes the organs of respiration are affected, and the individual makes peculiar expiratory noises.* In other cases, deglutition is peculiarly apt to be disturbed by their occurrence. Sometimes the throat-muscles exhibit occasional spasm, the "trachelismus" of Dr. Marshall Hall;† but it appears to me that this is by no means a common site for clonic contraction. I have inquired carefully upon this point in thirty-six cases,—twenty-four males and twelve females,—and with the result that trachelismus occurred in but four males and two females; thirty individuals,—viz. twenty males and ten females,—positively asserting that no such phenomenon as trachelismus ever existed in their experience.

By far the most common locality of clonic spasm is the arm or leg; and next to this the extensor muscles of the trunk; in the former situation there is slight or notable jerking of the limbs, in the latter jactitation of the body.

Tonic Spasm may exist in any muscle, but it is more commonly found in the calves of the legs than elsewhere. It assumes the form of cramp, and is attended by the ordinary pain of cramp in some instances; but it may exist without any sensational accompaniment, so that the individual may be unaware of its existence.

The relative frequency with which these three forms of motor

* See Case III.

† Memoirs on the Neck as a Medical Region.

disturbance are present in the two sexes respectively, may be gathered from the following table:—

Motor Changes.	30 Males.	Per centage.	26 Females.	Per centage.	56 Total.	Per centage.
Tremor ...	13	43·3	8	30·7	21	37·4
Clonic Spasm	22	73·3	10	38·4	32	57·1
Tonic Spasm	5	16·6	5	19·2	10	17·8

From this it appears that,—in the two sexes considered together, as well as in each sex separately,—clonic spasm is the most frequent motor phenomenon; tonic spasm the least frequent; and that between the two there is tremor. It appears, further, that tremor and clonic spasm are more frequently observed in the male than in the female sex, while tonic spasm is more common in the latter. Again, clonic spasm is in the male sex relatively to tremor or tonic spasm, more frequent than it is in the female sex.

But the sexual differences in regard of the motor phenomena may be more accurately represented by calculating the per-centage in relation to the number, with regard to whom there is, in respect of each symptom, a definite statement that it was either present or absent. In the former table, the per-centages are given in relation to the whole number of males and females respectively, and then collectively; in the following they are given in relation to the number of cases, with regard to which more definite information exists. Thus, in the former table 13, 43·3 per cent., shows the number of times that tremor is recorded in 30 cases of males; but, as of these 30 cases there are only 12 in whom it is positively asserted that tremor was absent, the number is reduced to 25, and the presence of tremor ought to be represented in relation to that reduced number. Similar reductions have to be made in regard of clonic and tonic spasm; and such being made, there is the following result:—

	Males.			Females.			General
Motor Changes.	Present.	Absent.	Total.	Present.	Absent.	Total.	Total.
Tremor ...	13	12	25	8	8	16	41
Clonic Spasm ...	22	5	27	10	10	20	47
Tonic Spasm ...	5	4	9	5	5	10	19

If now these numbers are reduced to the common standard of per-centage, we find the following relations :—

Motor Phenomenon.	Present in per cent. Males.	Females.
Tremor	52·00 ...	50·00
Clonic Spasm ...	81·48 ...	50·00
Tonic Spasm ...	55·55 ...	50·00

From this table it appears that, like the two other forms of motor disturbance, tonic spasm is more common in the male sex than in the female ; but that the difference between the two sexes in regard of tonic spasm and tremor is very slight, viz. from 2 to 5 per cent., whereas that in respect of clonic spasm is greater than it was represented by the first table, the difference between the sexes having been therein shown to be 16·2 per cent., but here 31·4 per cent.

As I have already stated, the intensity, with which these motor disturbances occur, differs widely ; and the relative frequency with which either one of them exists to a slight or to a high degree may be represented numerically thus :—

Motor Phenomenon.	Degree.	Males.	Per cent.	Females.	Per cent.
Tremor	Slightly marked ...	4 ...		... 0 ...	
	Highly marked ...	9 ...	69·2	... 8 ...	100·0
Clonic Spasm.	Slightly marked ...	10 ...		... 3	
	Highly marked ...	12 ..	54·5	... 7 ...	70·0
Tonic Spasm.	Slightly marked ...	4 ...		... 2 ...	
	Highly marked ..	1 ...	20·0	... 3 ...	60·0

From this it appears that both tremor and clonic spasm occur more frequently in both sexes as highly marked than as slightly marked phenomena ; but that in regard of tonic spasm this is true only in the female sex, the reverse relation being observed in the male.

Again, when the two sexes are contrasted, it is seen that all three forms of motor disturbance are highly marked phenomena more frequently in the female sex than in the male, and that this difference exists to the greatest degree in regard of tonic

spasm, where it amounts to 40 per cent.; to the second degree in respect of tremor, being 31 per cent.; and to the third degree in relation to clonic spasm, where it equals 16 per cent.

The following case is an interesting example of peculiar spasmodic movements in conjunction with epilepsy.

Case III. E. F.—*Male, æt.* 20; *had dentition-convulsions; first epileptic attack, at æt.* 16; *referred to excessive eating; soon after became subject to frequent spasmodic movements of limbs, face, and respiratory muscles, sometimes so severe as to throw him down. Mind not impaired until after spermatorrhœa, when became timid and depressed. Gradual improvement, and final restoration to health. No return for eight years.*

§ I. Male, aged 20, of Jewish parentage.

§ II. A. Born in London, is a butcher by trade, and a great eater; rather "wild" in his habits.

B. Had convulsions when 18 months old, and afterwards a rash came out on his face, but no fits occurred again until four years ago.

D. No hereditary predisposition to epilepsy.

§ III. A. Subject to occasional spermatorrhœa, but refers his first attack, which occurred at 16 years of age, to excessive eating and to sleeping after dinner.

B. First fit occurred while writing in a counting-house; he fell down, lost consciousness, and was convulsed.

C. Two or three days afterwards, a symptom which he calls the "starts" commenced. (See § IV., K.) For nine months the fits recurred every fortnight; since that time they have been more irregular.

§ IV. A. *February 11th*, 1853.—Short, thin, wiry-looking man, of dark complexion; now of steady habits, and not an excessive eater.

F. No palpitation of heart, but was subject to it two years ago. Heart-sounds normal.

K. Intellectual powers unimpaired. No pain.

Motility.—His hands and arms are tremulous, and there are occasionally distinct twitches of the facial muscles. He frequently has "starts;" when slight, these are merely a jerking movement of the arm, sudden and short, or an expiratory

movement, producing an abrupt grunt or bark; sometimes the leg is thrust out; when more severe, the start "throws him down," and this has occurred with so much vehemence as to knock his teeth out. He is thrown forwards, but does not lose his consciousness. The frequency and severity of these movements are increased by any moral or mental excitement, or by an indigestible meal. If his head leans forward, they are sure to occur.

§ V. D. Applicetur emplast. lyttæ, alt. noct. regioni spinali.

E. ℞ Pulv. rhei, sodæ bicarb., magnes. carb. āa ʒj.
Dec. aloës co., f. ʒij. Aquæ f. ʒxiv., ft. haust. o. n. s.

He has been taking three times daily for a month, and is to continue taking:—

Tinct. hyoscyami, ♏xx.
Vini ferri, ♏x.

April 7th.—§ III. C. The "starts" have been less frequent than before, with the exception of one night, when they were very numerous while at the theatre.

§ IV. A. Perspiring freely.

E. Respiration 16.

F. Pulse 80, not regular in force.

K. Tremor of arms and legs, with occasional clonic spasm. Never has any sensation of trachelismus. He complains that his head is weak, that he feels stupid, and "cannot look any one in the face." No undue irritability of muscles on percussion. Frequent emissions.

§ V. E. ℞ Ferri sulph., gr. j.
Acidi sulph. dilut., ♏xx.
Aquæ ʒj., ft. haust. t. d. s.

May 17th.—Has had several falls since last visit. Cannot take the medicine prescribed. Emissions more frequent.

Ferri carb. c. saccharo, gr. v., quotidie.

June 6th.—§ III. C. For ten days after last report had no "start" sufficiently severe to throw him down, but on the afternoon of that day had many violent jerkings for some hours. These were followed by a fit, in which he became unconscious, and fell into stupor, which lasted for half an hour. The weather was thundery and hot: he could in no other way account for the attack.

§ IV. A. Feels much better; "starts" not so bad.

July 12th.—Great complaint is weakness of head; says he thinks about too many things at once; sleepy in the day-time; sleeps well at night; face pale, but lips red.

§ V. E. Zinci oxydi, gr. iv.; extr. hyos., gr. j., ter die.
Pil. al. c. sapone, gr. iv. o. n.

August 8th.—"Starts" much less frequent; has fallen only once since last report.

September 9th.—Has been at seaside for three weeks. During that time had no "starts," but for the last fortnight has suffered from gonorrhœa.

From this period the health has been perfectly established.

From the facts stated in this section we may conclude:—

1. That, during their interparoxysmal period, the large majority of epilepties present evidence of disturbed motility.

2. That this disturbance takes one, two, or three forms of involuntary muscular activity.

3. That it is more common to find one than two forms in the same individual, and two than three forms.

4. That in the male sex such combinations are more frequent than in the female.

5. That, of the three forms of motor disturbance, clonic spasm is the most frequent, tonic spasm the least frequent, while tremor occupies an intermediate position.

6. That each of the three forms is more common in the male than in the female sex, and that the difference between the sexes is greatest, and very considerable, in regard of clonic spasm.

7. That it is more common to find these motor disturbances as well-marked symptoms than as trivial phenomena.

8. That the female sex exhibits a greater proclivity to their high development than the male.

9. That trachelismus is an exceptional form of muscular disturbance.

10. That, compared with disturbances in the mental condition, those of motility are much more frequent.

In these statements are included those variations of motility which can be regarded as, in any way, characteristic of epilepsy. There is something peculiar in the gait and other movements of some epileptics; but such peculiarities are by no means universal, and are generally the result of conditions more or less accidental

in their occurrence; as, for example, partial paralysis of one or both lower extremities.

Temporary and occasional uncertainty of, or incapacity for, muscular action I have noticed in three or four cases; some individuals saying that they felt as if the "legs gave under" them in walking, others that they allowed objects to slip out of their hands.

The general picture of the epileptic, so far as regards his motility, is that of an individual with trembling hands and uncertain movements, whose gait is awkward, and whose limbs, or whole frame, occasionally, exhibit startings, or present a restlessness resembling slight chorea. It must be remembered, however, that the picture may be that of a strong and robust man, with every movement resembling that of health and ease.

D. Organic condition of Epileptics during the intervals of their attacks.

1. General.—From the age when Hippocrates uttered his well-known aphorism, "Convulsio aut ab evacuatione aut a repletione,"* to the present day, it has been almost universally admitted that epilepsy might occur in every kind of constitution; that neither robust health nor intense depression of strength either necessitated its occurrence, or prevented its development.

Dr. Radcliffe has, of late years, contested the accuracy of the general belief, and has written much for the purpose of showing that the organic condition of the epileptic is one of debility. Thus, Dr. Radcliffe states, "In very many instances, if not in all, the hands and feet are cool or cold, the pulse is scarcely ever otherwise than weak and slow, and a feeling of chilliness is almost habitual. Indeed, so far as my own experience goes, the powers of the circulation are always defective, and I do not remember a single instance of a person suffering from simple epilepsy who had the red lips and face, the full pulse and distended veins of plethora, or even a faint semblance of such a state, except, perhaps, for a short time after the fit."† And again, "the habitual state of the circulation is one of depression."‡

As the facts observed by my friend Dr. Radcliffe led him to offer a new view of the pathology of this disease, I undertook,

* Aphorisms., § VI. 48.

† Epilepsy and other Convulsive Affections, p. 138. ‡ *Ibid.*, p. 156.

some years ago, an inquiry into the organic condition of epileptics, for the special purpose of ascertaining whether the "depression" Dr. Radcliffe so well describes,—and which all authors have recognised as occasionally associated with epilepsy,—was universally present in that disease; and if not, in what proportion it existed.

Before, however, furnishing the results of this inquiry, it appears to me desirable to bring forward a few authorities with regard to the possible co-existence of epilepsy and robust health, or even plethora.

Tissot speaks of epilepsy occurring "d'un des hommes les plus robustes que j'aie connu:"* and, referring to plethora as a cause of epilepsy, he remarks, "Il n'y a aucun médecin qui n'ait eu bien des occasions de s'en convaincre:"† and again, "C'est une des causes les plus fréquentes."‡

Portal—in accounting for the name "morbus Herculeus," formerly applied to epilepsy—says that this name was given to the disease by the Greeks, either because Hercules was supposed to have been subject to its attacks,§ or because "qu'ils croyoient qu'elle survenait fréquemment aux personnes de la plus forte constitution, comme cela a lieu en effet."‖

Maissonneuve affirms that,—"tous les jours . . on trouve des épileptiques chez lesquels on ne peut soupçonner d'autre cause première de l'épilepsie qu'un tempérament excessivement sanguin de sa nature, ou devenu tel accidentellement, par la suppression de quelque hémorrhagie habituelle," etc.¶ And he quotes seven cases having, as he believes, and as he appears in my judgment, warranted in believing, their origin in this condition.

Georget, in his definition of epilepsy, states that there is "presque toujours une intégrité remarquable des fonctions nutritives."**

Dr. Cooke says, "In almost every case which I have had an

* Œuvres, Tome VII., contenant le Traité de l'Épilepsie, p. 36.

† *Ibid.*, p. 122. ‡ *Ibid.*, p. 131.

§ See on this point, and others connected with the various names of epilepsy, "Dissertatio medica inauguralis de E. adultorum. A. A. Martini, 1740."

‖ Observations sur la Nature et le Traitement de l'Épilepsie, p. 115.

¶ Recherches et Observations sur l'Épilepsie, p. 106.

** De la Physiologie du Système nerveux. Maladies nerveuses. Tome II., p. 376.

opportunity of seeing, the disease has occurred in full habits and sanguine temperaments."*

Dr. Miller affirms, "Causa occasionalis frequentissima corpus plenius est."†

Dr. Prichard asserts, "I have witnessed its appearance in every variety of habit, from the most exquisite examples of the sanguine to the most strongly marked melancholic:"‡ and again, "Epilepsy often occurs in persons who have rapidly increased in bulk and fulness of habit."§

The authorities already quoted are, I think, sufficient to show that, if the result of my observation differs widely from that of Dr. Radcliffe, it is not because the cases which I have examined have been exceptional in their character.

In order to estimate the general organic condition of epileptics, I have examined them in regard of nutrition, temperature, and strength, judging of these by the following means.

Nutrition.—This has been determined by the bulk and firmness of the limbs, by the complexion, and general aspect. In all cases, I have inquired into the state of nutrition as compared with that before the disease existed; and as to its condition at the time of observation, compared with that which existed previously, but since the development of the disease.

Where the limbs have been well nourished, and firm; and where the state of the patient, *quoad* bulk and firmness, has undergone no change, I have termed nutrition "good." In the contrary conditions, the term "defective" has been employed.

Temperature.—This has been estimated by the habitual temperature of the hands and feet as compared with that of the trunk; by the readiness with which such temperature is affected by exposure to cold; by the appearance—blue, pale, or florid—of the face and extremities; and by the subjective sensation of cold or chilliness.

In some cases the thermometer has been employed, and the difference between extremities and the trunk registered; but in all cases the temperature, as judged by the hand, has been

* History and Method of Cure of the various Species of Epilepsy, p. 54.

† De Epilepsia, p. 27.

‡ Treatise on Diseases of the Nervous System, p. 94.

§ *Ibid.*, p. 102.

compared in these localities, and the patient's own feelings have been taken into consideration.

Where, in any one particular, there has been evidence of temperature lower than that of average health, it has been recorded as "diminished;" but in the absence of any proof of diminished temperature, it has been noted as "normal."

Strength.—The strength of individuals has been examined in respect of their capacity for great and prolonged exertion; their endurance of moderate exercise in relation to fatigue; and the amount of muscular energy and force that they possess.

Where individuals have been readily exhausted, or tired by an amount of exertion such as would not fatigue persons of their social position and general *physique;* or where they have complained of a weakness which formerly they did not feel; or where, in fact, I have been able to obtain any evidence of diminished strength, the case has been included under the category of "defective." But in the absence of any such proof, and, in many instances, with distinct evidence that the individual enjoyed great muscular power, the case has been placed in the group of "normal."

Adopting the principle of classification which has already been employed in regard of both the mental and motorial condition of epileptics, we may form four classes of these individuals by a consideration of their organic state. In the *first*, are those in whom no deviation from organic health could be detected. In the *second*, those who in one particular, and in one only, exhibited a defect. In the *third*, those who presented the combination of defects in two particulars; and in the *fourth*, those in whom nutrition, temperature, and strength were all three deficient.

The numerical frequency of these classes is as follows:—

Class, in regard of organic health.	Males.	Females.	Total.	Percentage.
1. With perfect health and strength ...	18	17	35	56·4
2. Defective in one particular	9	11	20	32·2
3. Defective in two particulars	5	1	6	9·6
4. Defective in three particulars	1	0	1	1·5
	33	29	62	99·7

So far as we may infer from this table, there is nothing to show that any organic ill-health is characteristic of epilepsy.

On the contrary, in more than one-half of the cases there is the positive statement that no sign of impaired organic vigour was present. Further, the number in whom notable debility existed was extremely small; and when we group together both the third and fourth classes, we find still a very small proportion, viz. 7 cases, or 11·1 per cent.

There is no considerable difference to be observed between the two sexes in regard of the numbers they furnish in each class: 54 per cent. of males and 58 per cent. of females being found free from any sign of depressed organic health.

But further, in 10 of those cases which form the first class of 35, there were 5 males and 5 females in whom the organic health has been described as considerably above the average. These individuals have been noted as "stout," with "very great" or "enormous" strength, with "florid complexion," and "more than average of robust health." So that if we were to form another class of those epileptics who presented remarkable organic vigour, we should find it to comprise as many as 16 per cent., which affords a very striking contrast to the proportion exhibited by the other extreme class, viz. 1·5 per cent.

And again, of those individuals who form the second and third classes above described, there were two men who assured me that at the time of their being attacked by epilepsy they were remarkably healthy and vigorous, and that the depressed health in which I found them had been produced by repeated bleeding, purging, and low diet.

There are differences to be observed in regard of the frequency with which the organic health exhibits deterioration in the three directions mentioned. These differences may be represented numerically by the following table:—

Property, and its condition.		Males. Actual No.	Males. Per cent.	Females. Actual No.	Females. Per cent.	Total. Actual No.	Total. Per cent.
Nutrition	Good ...	24	82·7	19	95·0	43	87·7
	Defective ...	5	17·2	1	5·0	6	12·2
Strength	Normal ...	15	71·4	16	80·0	31	75·6
	Defective ...	6	28·5	4	20·0	10	24·3
Temperature	Natural ...	18	66·6	11	52·3	29	60·4
	Diminished.	9	33·3	10	47·6	19	39·5

It appears from the above table that the order of frequency in which deviations from organic health present themselves is as follows,—temperature, strength, nutrition. Strength is impaired in twice as many cases as nutrition, and temperature is reduced in more than three times as many. But in regard of each condition, be it observed, it is much more common to find it normal than abnormal. Thus, in regard of temperature,—the condition most frequently exhibiting depression,—the proportion of normal to abnormal is as 6 to 4: while in the case of nutrition, the ratio is as 8·7 to 1·2. It is the exception, therefore, and not the rule, to find the epileptic, during his interparoxysmal period, presenting either one of the above signs of impaired organic health.

The sexual differences which appear in the above table are to this effect, that whereas impaired nutrition and strength are observed to be more frequent in the male sex than in the female, the opposite relation is found in respect of temperature, a larger number of females than of males exhibiting diminished temperature. The sexes agree with one another in the order of frequency with which each exhibits impairment.

The Pulse.—The quality of the pulse has been recorded in forty-four cases, viz. twenty-eight males and sixteen females; and in the following table I have represented the most striking characters it presented :—

Quality of pulse.	Males.	Females.	Total.		Per cent.
Full	4	1	5		
Firm	10	5	15	27	61·3
Medium full and firm ...	5	2	7		
Small	5	4	9		
Feeble	3	3	6	17	38·6
Irregular	1	1	2		
	28	16	44		99·9

Hence it appears that in 61·3 per cent. the pulse was either "firm," "full," or "moderately full and firm;" that in twenty-seven of forty-four cases, it was not below the average; and

that it was below the natural condition in seventeen only, these numbers being respectively 61 and 38 per cent.

The frequency of the pulse has been recorded in twenty-two cases—fourteen males and eight females; and the result may be represented thus :—

Sex, and number of cases.		Age.			Frequency of Pulse.		
		Minimum.	Maximum.	Mean.	Minimum.	Maximum.	Mean.
Males	14	14	75	24·21	72	108	85·40
Females	8	16	34	21·00	76	124	94·00

The mean frequency of the pulse in health, as given by M. Bérard, is, between twenty and sixty years of age, from 70 to 75; and between sixty-five and seventy-three years of age, from 75 to 80.* Dr. Carpenter states that between fourteen and twenty-one years of age the pulse ranges from 75 to 85; adding, that the frequency in the female sex exceeds that of the male by 10 or 14 beats per minute.† Compared, therefore, with the pulse in healthy individuals, the mean frequency of the pulse in epileptics is not below, but above the average.

The number of cases from which these results are taken is, I am aware, insufficient to establish with certainty a positive proposition with regard to the pulse; but the number is amply sufficient to prove that any statement to the effect that the pulse is invariably below the average,—either in frequency, or force, or fulness,—is inconsistent with fact.

While, then, refraining from any assertion as to whether there is any characteristic condition of the pulse in epileptics, or what such condition is, I confidently assert that it is not one of depression, and that no characteristic condition has hitherto been proved to exist.

2. Special.—There has been little attempt on the part of medical authors generally to show that epileptics constantly present, during the intervals of their attacks, any special deviations from organic health. So far as my own experience extends, there is no symptom which occurs with sufficient frequency in epileptics to be regarded as anything more than accidental.

* Cours de Physiologie fait à la Faculté de Médecine de Paris. Tome III., p. 104.

† Principles of Human Physiology, p. 485.

The digestive functions are sometimes impaired, but they are as frequently performed with perfect regularity and comfort. The same is true with regard to the genito-urinary functions of both sexes, and also with respect to the respiratory and circulatory. I have frequently sought for both albumen and sugar in the urine of epileptics, but have hitherto failed to detect the presence of either in any one instance. Of course I do not include under the name of epilepsy cases of Bright's disease, with uræmia, and convulsions. Dr. Sieveking found albumen temporarily in one case, and persistently in one case, out of nineteen, but he did not once detect sugar in fourteen cases.* "In the intervals of the epileptic attacks, no observations have yet been made which show any constant change in the urine."†

M. Sandras mentions a "disposition singulier et inexplicable" of the skin in epileptics. He states that when they are exposed to the sun they become covered, and especially on the face, with numerous "taches rosées," larger than those of rubeola, but separated by healthy skin. These spots have no elevation, and they appear and disappear in a few minutes, when the individual retires into the shade.‡ It has not occurred to me to observe this phenomenon, but I have frequently noticed in epileptics a temporary pallor or a temporary duskiness of different parts of the body. This duskiness is of peculiar, leaden, or slatey hue, and is especially common on the face. It may be observed also in the hands, and pre-eminently under the nails. Sometimes the face of an epileptic acquires an habitual dusky tint, similar to that produced by taking nitrate of silver, and in certain instances it may be dependent upon that cause, but I have noticed it several times in individuals who have not taken that medicine.

If, now, we recapitulate the results of the preceding subsection, they may be stated in the following propositions :—

1. That epilepsy is not incompatible with perfect physical health.

2. That it is the exception, and not the rule, to find serious impairment of the organic constitution.

* Medico-Chirurgical Transactions, Vol. XL., p. 162.

† Parkes on the Composition of the Urine, p. 311.

‡ Traité pratique des Maladies nerveuses, Tome I., p. 203.

3. That epilepsy may coexist with physical health and strength considerably above the average.

4. That the coexistence of epilepsy with such extremely robust health is more common than its coexistence with extremely impaired health.

5. That the order in which the organic health, when impaired, exhibits deterioration is the same in each sex, viz. temperature, strength, nutrition.

6. That in each particular it is the exception, and not the rule, to find such deterioration.

7. That there are certain sexual differences, the most notable of which is the greater proclivity of the female sex to exhibit decrease of temperature.

8. That epilepsy is not incompatible with a full, firm, and frequent pulse.

9. That it is more frequently found associated with a pulse equal to the average of health than below the average; and that the mean frequency of the pulse in epileptics is above that of individuals of the same mean age not epileptic.

10. That there are no special departures from organic health which are characteristic of epilepsy.

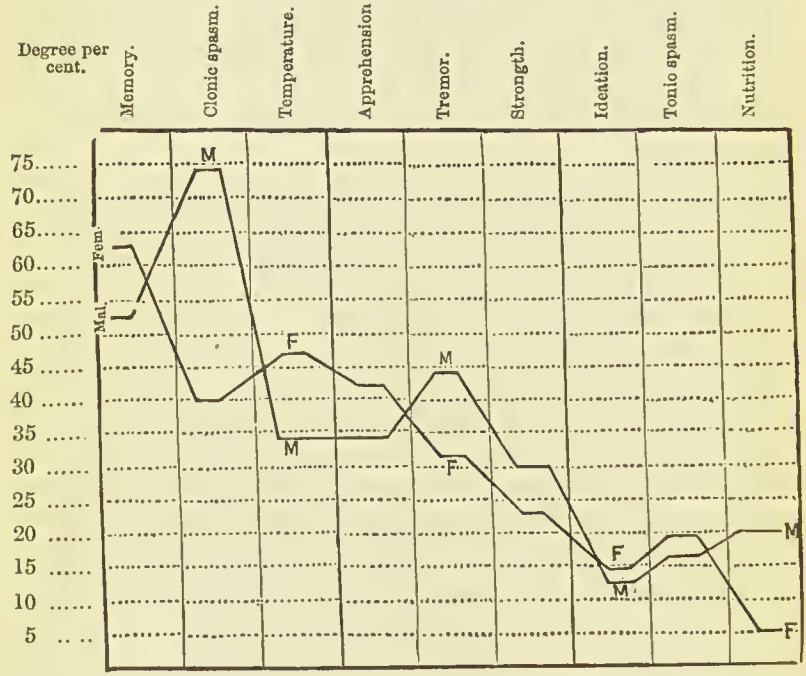
11. That compared with disturbances in mental and motorial functions, those of the organic health are much less frequent.

E. Relation between mental, motorial, and organic functions in regard of the deviations they present in Epileptics.

The frequency with which epileptics exhibit deviations from health differs in the two sexes, and may be represented thus:—

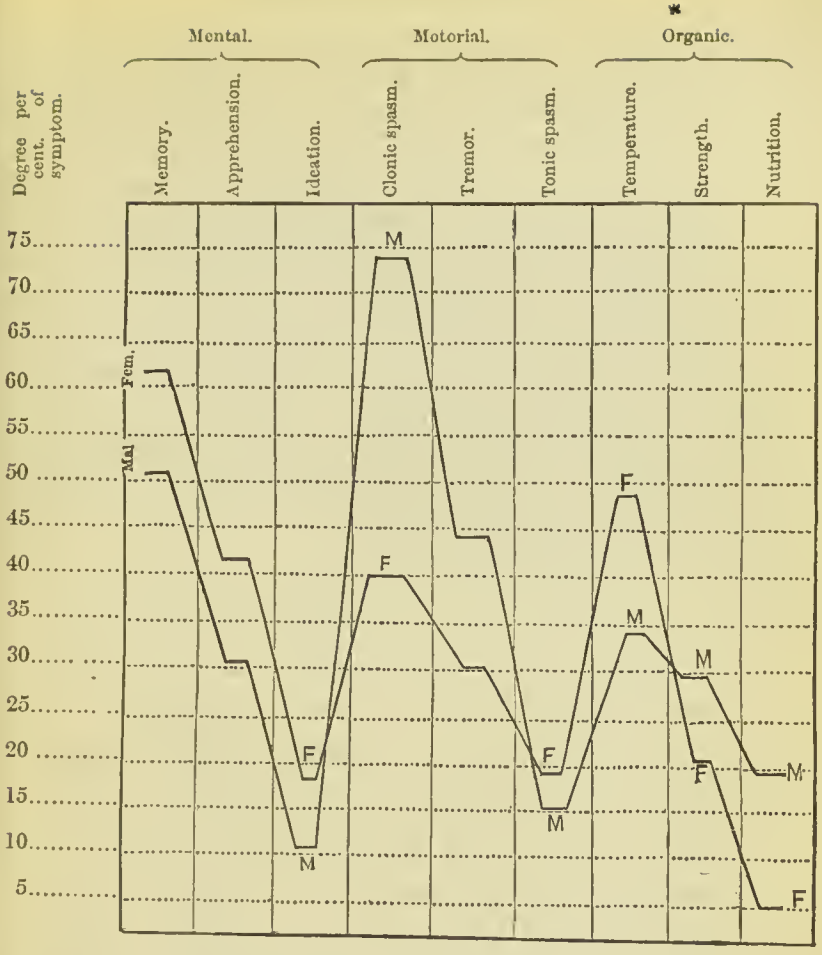
Males.	Per cent.	Females.	Per cent.
A. 1. Clonic spasm ...	... 73·33	B. 1. Impaired memory	... 62·50
B. 1. Impaired memory	... 51·51	C. 1. Diminished temperature	47·61
A. 2. Tremor	... 43·33	B. 2. Defective apprehension	... 42·84
C. 1. Diminished temperature	33·33	A. 1. Clonic spasm ...	... 38·48
B. 2. Defective apprehension	... 33·33	A. 2. Tremor	... 30·73
C. 2. Impaired strength	... 28·57	C. 2. Impaired strength	... 20·00
C. 3. Defective nutrition	... 17·24	A. 3. Tonic spasm ...	... 19·23
A. 3. Tonic spasm ...	... 16·66	B. 3. Imperfect ideation	... 17·86
B. 3. Imperfect ideation	.. 11·76	C. 3. Defective nutrition	... 5·00

The curious fact shown by this table is that, although in regard of each division of vitality, the same order of impairment is exhibited by the two sexes,—viz. memory, apprehension, ideation; clonic spasm, tremor, tonic spasm; temperature, strength, nutrition;—that, in the male sex, defective health is observed in the order,—motility, mental power, organic condition; and in the female sex in the order,—mental capacity, organic condition, motility. These relations may be represented by the following diagram :—



In the above, the first of each division of vitality is taken first, then the first of the next, and then the first of the third. These are followed by the second of the first division, the second of the second, and so on: so that the table represents the relations of the two sexes to each of the three groups of symptoms; showing the relative proclivity of each sex to mental, motorial, and organic disturbance, at each degree of deterioration.

Another diagram exhibits these relations in a different order :—



In this second diagram, the degree to which either sex exhibits the proclivity to disease in each sphere of vitality is represented by the height of the line; and, although the line follows a similar direction in each sex, it will be seen that in absolute position it varies much.

The first diagram contrasts the proclivity of the sexes to disturbance in regard of, respectively, mental, motorial, and organic conditions; the second table compares their proclivity to each particular kind of disturbance in the same three classes of conditions.

By adding together the number of the classes presented by each individual, we may obtain an approximative measure of the degree to which they are removed from perfect health; and,

by ascertaining the proportion these degrees bear to one another, we may measure the tendency of epilepsy to injure life. Thus, those whose health was intact, in either of the three spheres of vitality, were numbered one for that sphere; those in whom one faculty was impaired were numbered two, and so on. We may, therefore, in combining these numbers, find them ranging from three to twelve,—three being the highest degree of health, and representing those in whom neither mental, motorial, nor organic conditions exhibited any impairment; twelve being the number which would represent an individual who was damaged in each of the three conditions, and each of the three sub-conditions. The first number, three, occurs eight times; but twelve is not once found; the highest number actually presented being nine. The following table exhibits the numerical relations:—

Sum of numbers of classes.	Degree of injury.	Males.	Females.	Total.		Per cent.
3	0. Health	5	3	8		12·69
4	1st. Of failure... ...	4	6	10		
5	2nd. ,, ...	8	10	18	39	61·90
6	3rd. ,, ...	7	4	11		
7	4th. ,, ...	8	4	12		
8	5th. ,, ...	0	2	2	16	25·39
9	6th. ,, ...	2	0	2		
		34	29	63		99·98

From this table it appears, that in 12·6 per cent., there could be discovered no deviation from health; *i. e.*, that eight individuals were found who, in respect of mind, motility, and organic condition, did not differ from the ordinary mass of humanity, and presented, in the interval of their attacks, no symptom of disease. But 87·2 per cent. exhibited some degree of deviation; and, therefore, we must regard it as the exception, and not the rule, for the epileptic to appear in perfect health. Again, of these 87 per cent., there are 61·9 who presented deviation from the first to the third degree, and but 25·3 who exhibited it from the fourth to the sixth. Hence

epileptics moderately or slightly impaired in health are more than twice as numerous as those whose condition is more seriously damaged.

II. PAROXYSMAL SYMPTOMS.

The attacks of epilepsy differ so much in regard of the number of muscles affected by spasm; the locality and functions of these muscles; the intensity of their contraction; and its persistence, that some form of division is necessary in order to describe them. It has been already stated* that in some attacks there is no evident muscular contraction, although it may be inferred that the element of spasm is not absent, but is confined to the contractile fibres of the vessels. In other attacks, there is more or less evident and extensive tonic spasm of the muscles of animal life; but there is not that amount which is ordinarily understood by convulsion. In a third class of attacks, there is a peculiar series of events :—viz. loss of consciousness, tonic spasm, arrested respiration, clonic spasm, stertorous breathing, and coma;—which series has, for a long time, passed under the name of general or epileptiform "convulsion." And again, there has been seen occasionally a paroxysm similar to that of epilepsy, in regard of the convulsive element, but differing from it in the fact of consciousness being retained. Those who present the last-mentioned form of paroxysm ought, in my opinion, to be excluded from the category of epileptics; but their attacks will be described hereafter, and with some comments. There remains, therefore, but a difference of degree and distribution, in the essential phenomena of the first three classes; and the one form of attack graduates into the other through such imperceptible stages,—not only in different, but in the same individuals,—that it is possible to describe only typical forms of seizure, and is quite impossible to separate them from each other by any broadly-marked lines of distinction.

At the one extreme, we have attacks consisting of evident disturbance in regard of mind alone; at the other, paroxysms of convulsion without notable loss of consciousness; and, between the two, a combination—in divers degrees of

* P. 32.

intensity—of general spasmodic contractions with mental obscuration. These may be represented thus:—

1. Loss of consciousness.
2. ,, with local tonic spasmodic movements.
3. ,, with general tonic, and clonic convulsion.
4. General or partial convulsion, without complete loss of consciousness.

The first and second forms may be termed, with the French authors, "le petit mal," or epilepsia mitior; the third form "le haut mal," or epilepsia gravior; and the fourth, epilepsia abortiva.

That which separates attacks of "le haut mal" from "le petit" is the presence of clonic spasm following the tonic, and the combination of this with more or less asphyxia.

A. Epilepsia mitior; or, le petit mal.

There are, as already stated, two forms of "le petit mal:" in the one there is no evident spasm; in the other there is.

1. *Epilepsia mitior, without evident spasm.*—Although M. Delasiauve states that epileptic attacks always present "leur traduction extérieure;"* and Portal,† Hasse,‡ and others speak of spasm as constantly present, we are bound by experience to say, that in some instances such spasm is not to be observed; and, by pathological inference, to assert that visible spasm is by no means necessary.

All that is positively known to occur is a sudden and temporary, but absolute arrest of both perception and volition. The individual so attacked loses consciousness, for two or three or more seconds; and may, after that period, resume his sentence, or employment, perfectly unaware that anything abnormal has transpired. Thus Georget mentions the case of a lady who was frequently attacked while performing on the pianoforte, and who would resume the phrase of music which was broken by the seizure.§

If such attacks take place when the individual is standing, he may exhibit no loss of equilibrium; or he may lean slightly forward, or to one side. I have known these seizures

* Traité de l'Épilepsie, p. 56.

† Observations sur la Nature et le Traitement de l'Épilepsie, p. 130.

‡ Virchow's Handbuch, ant. cit., p. 255.

§ Maladies Nerveuses, ant. cit., p. 384.

to occur in a gentleman while hunting, and yet he has maintained his seat. Sometimes there is pallor of countenance; at other times there is pallor succeeded by slight flushing; again, there may be flushing, or a dusky hue without previous pallor; but in certain cases, there is no evident change of colour;—the face appearing precisely the same, in this respect, before, during, and after the suspension of consciousness.

It often happens, however, that the attack—although unaccompanied by apparent spasm—is of more than this momentary duration; and that some after-effects are observed, which continue for a variable time. Thus, although perception and volition return, after a few moments' suspension, they do not return to their normal state; but the patient is confused, and may exhibit some delusion; *i. e.* he may not only fail to comprehend where he is, or to recognise a well-known face, but he may be under the impression that something has transpired which is not the fact, or that a person near him is somebody else. He is dull of apprehension, depressed in spirits, suspicious; and, for an hour or two, may remain in this condition, and be quite forgetful of what has occurred immediately before the attack, or even for several days beforehand. Gradually, however, he recovers, and is in the same state as before.

In other instances the attack is preceded and accompanied, for the first few moments of its occurrence, by vertigo; the individual thinking that he is about to fall, and perhaps exhibiting some tendency to do so. He staggers, and grasps some object for support; or his legs sink under him; or if sitting, the muscles which maintain the erect posture, yield; and he slips forwards or to the side. It rarely, however, happens that the patient falls,—he ceases to perform any act requiring volition;—*i. e.* he ceases to speak; to use his fingers, if writing or otherwise engaged: but those movements which are primarily automatic continue, such as those which combine to produce the erect position, either of sitting or standing; and those which are secondarily automatic are only disturbed, but not arrested,—so that the individual may continue riding or walking, and may still hold in his hand the pen, riding-whip, or walking-stick, which he grasps by an unconscious effort. He may not stand symmetrically; he may walk doubtfully;

may grasp an object less firmly while the attack continues, than he did before; but the co-ordinated movement persists, and differs only in the force with which it is exhibited.

2. *Epilepsia mitior, with evident spasm.*—This is, I believe, much more common than the preceding. The mental condition is like that already described, but there is the addition of apparent muscular contraction.

The extent, locality, intensity, and persistence of the muscular spasm differ widely in different cases, and also in the same individual at different times.

As to extent, the contraction may range from that of one or two muscles of the eyeball, or the mouth,—producing strabismus, or a slight grimace,—to a tonic contraction, and temporary rigidity of the whole body.

The locality, when of limited extent, is equally variable: either the facial muscles, or those of a finger or toe; the muscles of the neck, or those of the chest-walls, may be the seat of spasm; the motor and other effects being in relation to the particular muscle or muscles contracting. It has not occurred to me to notice any special proclivity of one set of muscles to be affected; except that the face and neck, being more constantly exposed to view than any other part of the organism, appear to be more commonly the seat of contraction than any other part. It is, as I have already stated (p. 63), the exception and not the rule, to find any evidence of trachelismus. The evidence of laryngismus is wanting; but arrest of the respiratory movements, through temporary fixation of the chest-walls and diaphragm, has appeared to me a common occurrence.

It is unnecessary to say anything of the motor effects of spasm, for they are sufficiently obvious: strabismus, grimace, grinding of teeth, wry-neck, shortened arm, drawn-up leg, &c. &c., may, any one of them, occur in attacks of "le petit mal." But there are other effects requiring a moment's consideration, viz. those on the veins, and on the respiratory movements.

Dr. Marshall Hall has, in numerous papers, drawn attention to the fact that muscular action may compress the veins of the neck, so as to impede the passage of blood through them; and of this fact there is, I think, quite sufficient evidence, at all events, with regard to the external jugular vein. Experi-

mentally, I showed some years ago that contraction of the muscles of the neck, induced artificially by electro-magnetism, would occasion venous congestion of the surface of the face and neck.* And in cases of epilepsy and hysteria, I have had occasion to observe this effect of muscular spasm; but it appears to me that such a locality of contraction is rare, and that trachelismus does not occupy the important relation to epilepsy that it was supposed to do by Dr. M. Hall.† The movements of respiration are arrested in many cases of "le petit mal," and as a consequence of this, rather than of trachelismus, the lips and face become dusky in tint; but the asphyxia thus produced never continues so long, nor is it carried to such a degree, as to occasion the special phenomena of asphyxia, clonic convulsions. If the latter are produced, the case becomes one of "le haut mal."

The intensity of the spasm varies; but within no very distant limits; violent contraction is, if ever present, extremely rare, and it is most common to witness spasm of such moderate force as to render a limb resisting, but by no means inflexibly rigid.

The persistence of the contraction is liable to much variation. Generally speaking, it is of short duration, but while it lasts it is unbroken. It is tonic, not clonic contraction; and when commencing, as it often does before consciousness is lost, there is evidence to show that it is not accompanied by any painful sensation.

Attacks of "le petit mal" are sometimes unassociated with any evident vascular changes, while at other times such changes are extremely prominent. Thus, an enfeebled pulse and pallor of the countenance may be observed in one individual; while flushing, followed by duskiness of the face, palpitation of the heart, and throbbing pulse, may exist in another.

B. EPILEPSIA GRAVIOR; OR, LE HAUT MAL.

As already stated, there are two forms in which the well-known epileptic paroxysm presents itself: in one there is complete loss of consciousness, and in the other there is not; the former is extremely common, the latter is extremely rare,

* Memoirs on Neck as a Medical Region, by Dr. M. Hall. 1849. P. 27.

† See further, Chap. V., Pathology.

and may be regarded as an abortive, or preliminary variety of attack, rather than a genuine epileptic seizure.

1. *Epilepsia gravior, with complete loss of consciousness.*—It will be convenient to describe separately, the premonitory symptoms, those of the attack itself, and those which follow it.

(*a.*) With regard to the *premonitory* symptoms, their frequency and their nature, there is much difference to be found among authorities. There is, however, no doubt that sometimes they are wanting altogether; and that they vary widely in different individuals, and in the same person, at different times. We must distinguish between those which occur immediately before the attack, and those which are present at a longer interval, viz. for hours or even days. The latter resolve themselves into a mere exaggeration of the interparoxysmal phenomena; the former may be quite distinct from anything which occurs, except as the immediate forerunner of an attack.

There are only two classes of symptoms which I have observed at the distance of so much as a few hours even from the onset of the paroxysms; one of these is a modification of the mental condition, and the other a peculiar duskiness of skin. In certain individuals there is a change in the mental habit; they become either depressed, morose, and taciturn to an unusual degree; or excited, irritable, and loquacious. Esquirol states that some patients have "les facultés intellectuelles plus exaltées la veille et le jour de l'explosion de l'accès;"* but this, although undoubtedly occurring sometimes, is much more rare than the reverse condition. The duskiness of skin referred to is best seen on the face and neck; and in a few cases which have come under my own observation, it was a distinct and valuable indication of an approaching paroxysm. The duskiness often appears four or six hours, or even twelve hours, before an attack.

The symptoms which immediately precede the paroxysms are of very different kinds. Romberg says that they are either psychical, sensory, or motor;† but there are prodromata which

* Traité des Maladies Mentales, ant. cit., Tome I., p. 279.

† Manual of Diseases of the Nervous System. Syd. Soc. Translation. Vol. II., p. 397.

cannot be referred to either one of these categories. We must allow the existence of another series, viz. those which are outside the nervous system, at all events phenomenally, and are "extrinsic."

Mental prodromata have been observed at all times. Thus Aretæus mentions a "crash" or noise in the head as very common, especially at the first attack; the patients, at the same time, experiencing a delusion with regard to it, and stating, when they recover, "how they have been maliciously struck by some person."* But besides this sudden noise, the attacks are often forewarned by unusual depression of spirits; sudden and unaccountable fear; by excitability, or drowsiness and confusion of thought. "An unusual flow of spirits for a day," has been mentioned by Dr. Bright as "the constant forerunner of the attack."† "Even the exalted irritability in the nervous system . . . manifests itself in the epileptic before the attack, very often by greater restlessness, and increased tendency to passion."‡

Sensorial phenomena are also observed. Often there is some extraordinary and inexplicable sensation, such as "internal working;"§ or there are feelings still less susceptible of reduction into words. At other times, there are more or less definite feelings, which are modifications of either general or special sensibility. Thus Dr. Radcliffe mentions an "intense feeling of hunger."‖ Hasse describes epigastric pain, nausea, and rumbling.¶ Dizziness or vertigo has occurred in my own cases more frequently than any other modification of sensibility; whereas affections of the special senses have appeared to me to be rare. Romberg states that sight and hearing are affected more commonly than the sense of smell.**

Motorial symptoms occur in the form of tremor, twitching, tonic spasm, or co-ordinated movement; and also in the form of

* Extant Works of Aretæus. Syd. Soc. Translation, p. 244.

† Reports of Medical Cases, Vol. II., p. 511.

‡ Van der Kolk. Syd. Soc. Trans., p. 226.

§ Watson's Lectures on the Principles and Practice of Physic. Ed. III. Vol. II., p. 630.

‖ Epilepsy and other Convulsive Affections, p. 144.

¶ Virchow's Handbuch, Krankheiten des Nerven Apparates, p. 250.

** Manual, ant. cit., p. 197.

powerlessness, or pseudo-paralysis. Thus, Portal speaks of "un frisson" as being a frequent precursory phenomenon;* while Dr. Prichard says that the premonitory symptom is "generally represented as a convulsive tremor."† Clonic and tonic contractions have been very frequently observed; but, besides these, peculiar co-ordinated movements sometimes occur, such as running forwards, or backwards, or turning round. Thus Schenck mentions a man who "prius multoties in gyrum veluti verti." Andrée relates two cases of "running forward."‡ Again, loss of motor power is sometimes the forerunner of an attack; and this, Tissot states, is especially the case in old people.§ Romberg mentions the same phenomenon, viz. "a sudden relaxation and loss of motility."‖

The prodromata which are extrinsic to the nervous system are vascular and secretory effects. Thus Tissot mentions, as having seen constantly in one individual ten hours before the attacks, "une rougeur assez marquée au haut des narines, et entre les deux sourcils."¶ Dr. Cooke says that Mr. Hutchinson told him of a case in which the approach of the epileptic paroxysms was indicated by a "singular blue colour of the gums;"** and Mr. Jackson mentions, among the prodromata of attacks, a "slight swelling of the hands, and lividity of the ends of the fingers."†† Dr. Radcliffe says, "Usually . . . the pulse may become feebler than it was before, and not unfrequently the patient will complain that nothing will warm him or keep him warm."‡‡ And in regard of secretions, Dr. Schönbein informed Romberg, that in blistered patients the serum became acrid before the paroxysms;§§ and Portal speaks of "salivation" as a premonitory symptom.‖‖

The frequency with which prodromata of all kinds may occur

* Observations sur la Nature et le Traitement de l'Épilepsie, p. 125.
† Treatise on Diseases of the Nervous System, p. 89.
‡ Cases of the Epilepsy, &c., pp. 42 and 46.
§ Œuvres, Traité de l'Épilepsie, Tome VII., p. 131.
‖ Manual, Vol. II., p. 198.
¶ Traité de l'Épilepsie, p. 172.
** History and Method of Cure of the various Species of Epilepsy, p. 6.
†† An Inquiry into the Nature and Causes of Epilepsy, p. 9.
‡‡ Epilepsy and other Convulsive Affections, p. 143.
§§ Manual, ant. cit., p. 198.
‖‖ Observations sur la Nature, etc., p. 128.

has been differently stated by authors. Thus M. Herpin says that he discovered them in but nine of thirty-five individuals;* whereas Dr. Sieveking states that there were some premonitory symptoms in one-half of his cases; and Romberg furnishes the same proportion.†

By many authors the term "aura" has been employed, both vaguely and variously, to denote all kinds of premonitory symptoms which occur immediately before and pass on into the attacks; or which—having done so several times—have been also observed to occur without being followed by an attack. In the latter case the so-called aura has been sometimes arrested by artificial means, and at other times it has disappeared spontaneously. Without now entering upon any discussion of the nature of this aura, it may be observed that the special characters of the premonitory symptoms to which this name has been applied have been these,—that the phenomenon has occurred in some distant part of the body; that it has travelled upwards, towards the head; that it may sometimes be arrested in its course; and that when it reaches the head consciousness is lost, and the paroxysm itself has begun.

Classifying into groups the immediate prodromata of epileptic paroxysms, those which have been observed in my own cases are as follows:—

I.	Mental and emotional in . . .	9 cases.
II.	Sensational disturbances in . .	16 „
III.	Motorial „ . .	7 „
IV.	Extrinsic „ . .	3 „
V.	Positively no prodromata in . .	33 „
VI.	Doubtful in	13 „
		81

These numbers are reduced to per-centage in the following table; and I have stated also therein, the relative frequency with which different kinds of disturbances occurred in the first four groups, and in the two sexes respectively.

* Du Pronostic et du Traitement curatif de l'Épilepsie, p. 380.
† Manual, ant. cit., Vol. II., p. 197.

Group.	Special phenomena.	Males.	Females.	Total.	Per-centage.	
I. Mental and Emotional.	Drowsiness	1	0	1	Excluding Group VI. of "doubtful," and calculated therefore in proportion to 58 cases.	
	Obscurity of thought	2	0	2		
	Confusion and talkativeness	1	1	2		
	Inexpressible fear ...	1	0	1		
	Depression of spirits...	0	1	1		
	Excitement and irritability	2—7	0—2	2—9	...	11·1
II. Sensational.	Dizziness, or vertigo...	4	3	7		
	Cephalalgia	1	1	2		
	Weight at cardia ...	1	0	1		
	Pain in groin and hip	1	0	1		
	Pleasing sensation in legs	1	0	1		
	Pain in arm	2	0	2		
	Nausea	0	1	1		
	Tightness in throat ...	1—11	0—5	1—16	...	19·8
III. Motorial.	Twitching of face, with bloodshot eye	1	0	1		
	Rigidity of arm ...	0	1	1		
	Cramp	1	0	1		
	Loss of power in hands	1	0	1		
	General twitching ...	1	0	1		
	Twitching, and drawing up of leg ...	1	0	1		
	Palpitation of heart	0—5	1—2	1—7	...	8·6
IV. Extrinsic.	Dark under eyes or ears	2	1	3	...	3·7
V. Absent.	Positively no prodromata	18	15	33	...	40·7
VI. Doubtful.	Information absent, or uncertain ...	2	11	13	...	16·0
		45	36	81	...	99·9

From the foregoing table it appears that prodromata are, in

some form or another, more frequently positively present than positively absent; their presence being recorded in 43·2 per cent., their absence in 40·7. It is also evident that they assume most commonly the form of abnormal sensations; and that their lowest frequency is observed in regard of extrinsic changes. The order of frequency in which the different groups of prodromata present themselves is as follows,—sensational, mental, motorial, extrinsic. The motorial phenomena are twice as numerous as the extrinsic, the mental three times as numerous, and the sensational five times as frequent. The most common precursor of attacks appears to be vertigo; it having been observed in nearly ten per cent.

As to sexual differences there are none of any note except the fact that from the female sex it was more difficult to obtain reliable information than from the male; there being eleven doubtful cases among the former, and only two among the latter.

It is important to bear in mind the facts, that in thirty-three cases there were positively no prodromata; and that in thirteen additional cases,—making forty-six of eighty-one,—there was no evidence of their existence; so that the presence or absence of precursory symptoms tells neither way in regard of diagnosis, or the general pathology of the disease.

The existence of anything like the "aura" as described by old authors I have never happened to meet with; but in one instance have known the drawing up of leg, and in another jerking of the arm, to extend apparently towards the trunk, and to pass into a general paroxysm so soon as it reached the trunk; in a third case a stabbing pain in the arm preceded the attacks, and in these individuals the fits might occasionally be arrested by grasping firmly the thigh or upper arm, or by forcibly extending the limbs.

The length of time occupied by the above-mentioned symptoms varies from a few seconds to one or two hours; but more commonly it ranges from thirty seconds to five or ten minutes. Those symptoms which have exhibited the longest duration have been the mental; the shortest have been the vertiginous sensations. The muscular twitchings have recurred two or three times, and perhaps have been arrested; and then, after a few seconds' actual duration, have passed into the fit.

It is evident that we cannot draw the line between the ordinary interparoxysmal condition and some of these precursory phenomena; for the one condition graduates into the other imperceptibly. This is especially true of the mental and sensational prodromata: but others, such as the motorial, may be readily separated. However true this may be with regard to the commencement of the prodromata, we can readily limit them on the other side; and say when they have ceased and the attack itself has begun. That which separates them is the condition of consciousness. During the prodromata it is retained; during the paroxysm it is lost.

The three following cases are illustrations of the so-called "aura." In two there was muscular contraction, and in one of these much pain; in a third,—not a case of true epilepsy,—there was pain only.

CASE IV. G. H.—*Male; no hereditary predisposition; commenced æt. 25, apparently from sexual excesses; attacks preceded by "aura," or pain; could be arrested by pressure very frequently; but not produced by irritation of spot whence aura originated. Mental, motor, and organic condition very slightly changed. Various attempts at treatment unsuccessful.*

§ I. Male, æt. 26.

§ II. A. Born, and has lived all his life in the country. Was a butcher after æt. 16; was in the habit of taking meat freely, and at times drank a great deal of beer and gin. Was irregular in regard of quantity; was sometimes drunk, but not often. Was very strong; could lift a half-hundred weight on little finger of left hand.

B. Never had infantile convulsions; and as a boy was very healthy.

C. At thirteen years of age masturbated, and continued the practice for twelve months, two or three times a day. At fourteen years of age first had connexion with women; and after twenty years of age was addicted to excesses in this particular.

D. Father died of gout, æt. 60. He kept "a public," and "drank very hard." Mother is living, and healthy. Three brothers and three sisters living, and no one of them has ever

had an epileptic attack. His mother's brother and sister had apoplectic seizures: the former died; the latter recovered. Knows nothing of maternal grand-parents; knew those on father's side well, and never heard of their having attacks.

§ III. In September 1857, he being then twenty-seven years of age, had some kind of convulsion in his sleep at night. He knew nothing of this for some days; but it was observed by his brother who slept in the same room. On the evening of the fourth day after this he was dancing for some hours, and perspiring very freely. He "went home" with his dancing companion, and during intercourse, and at the moment of emission, lost his consciousness, and had a severe convulsion. It was after this occurrence that his brother told him of the previous attack. Since that time he has abstained from intercourse; and has had occasional emissions during sleep.

His earlier attacks "appeared to come on up the spine," and he had a seton put into the neck. The attacks ceased for between three and four months. He then took the seton out, and took to drinking hard.

One morning, at eleven o'clock, he was suddenly seized with stabbing pain just above the left elbow, the arm began to shake, and a fit followed. Since that time the fits have always been preceded by pain in the arm.

He was told, six months ago, that if he pressed on the arm at the painful spot the fit could be stopped, and he has found that this is true sometimes, but he cannot always stop them. If he attempts to lift any heavy weight with the left arm, he is sure to bring on the fit.

He has had, for the last three months, as many as three fits daily; but the stabbing pain in the arm occurs much more frequently.

§ IV. A. Healthy-looking man; hands warm; complexion good. D. Tongue clean, digestion good.

E. F. H. Pulse, respiration, urine, normal.

K. *Mental.*—He is exceedingly sensible in answers; appears to understand quickly, and to remember well; gives details of illness with apparent accuracy, but says that memory fails. He is somewhat timid, and superstitious. He wears, on the fourth finger of his left hand, a silver ring, begged of thirty girls,

who contributed a penny each. This is considered to be a "charm." When asked if he believes it can do him any good, says, "No, but with such a disease as this one is willing to try anything."

Motility.—There is no evidence of either tremor, tonic spasm, or clonic.

General health is good. Temperature, nutrition, and strength are not deficient: the two latter less than they were when attacks commenced.

Attacks are always preceded by a stabbing pain in the lower part of the belly of the left biceps muscle, on the inner side especially. The pain is not in the skin, but deeper, and seems to go through the arm. If this spot is immediately grasped so as to press both skin and muscle against the bone, the pain ceases in a few seconds, and nothing more occurs. If pressure is not exerted directly, the biceps contracts, and draws up the forearm, and it requires firmer grasping and extension of the limb to prevent the attack. The pressure must be exerted upon the biceps; the effect is not produced by directing it upon the trunks of nerves, or upon the vessels. Once while arresting a fit with my own hand, I observed both radial and ulnar arteries to be still pulsating. There is no doubt about the fact that this pressure, in some way or another, does arrest the attacks; it effects more than a relief of pain which might or might not run on into a paroxysm. This I had occasion to establish once by an attack coming on while I was talking to the patient. He said, "Here it comes," and his face immediately betrayed great horror, his respiration ceased, and his pupils dilated widely; I grasped the arm firmly, and the natural expression of face returned, the pupils contracted, the face flushed, perspiration broke out, and nothing more occurred. He did not lose his consciousness. The fits when, as he expresses it, they "get past the arm," are fully-developed paroxysms of epilepsia gravior.

There is nothing abnormal to be observed in the skin of the arm; there is nothing unusual to be felt in the subjacent structures. He can execute all movements of the joints, and put the limb into any posture without causing the pain, &c. Violent exertion, or effort, however, will bring it on. I tried

repeatedly to induce the pain, or aura, by pinching the skin, pressing the tissues, applying heat and cold, and galvanism to every part of the arm, but never succeeded in producing either.

§ V. Generous diet, and simple aperient medicine, were ordered; the chief attention being paid to the aura.

Two or three apparatuses were applied to the part, and these were ingenious enough to look at, but did not effect the purpose. The most successful was contrived by a patient in the same ward, and this he wore constantly. It consisted of two pieces of wood, made like the handles of a lemon-squeezer, having shoulders projecting inwards, and covered with leather at points corresponding with the part of the biceps to be compressed. These were tied together at the top by a string about an inch long, occupying the position of the hinge of a lemon-squeezer. The two handles were loosely held together at the other end by a piece of tape. The moment that the pain occurred he grasped the handles, and, having considerable leverage, could have pinched a piece out of his arm if he liked. He managed to stop many fits daily by this instrument.

The skin was well blistered, but this did no good.

Sedatives were applied to it, but they also failed.

A powerful continuous current of galvanism, and an interrupted electro-magnetic, were likewise employed, but without avail.

It was attempted many times by myself, and subsequently by Dr. Richardson, who kindly took much interest in the case,* to induce "voltaic narcotism" of the part; but anæsthesia could never be induced.

The actual cautery was applied by my colleague, Mr. Henry Power, but this also failed to influence the attacks.

The patient was for many weeks in Westminster Hospital. His attacks appeared reduced in number by conium, but beyond this no effect was produced upon the malady.

I have heard of him since; he is in the country, and still suffering from the disease, but declaring that he is almost free from it at times when he keeps himself half-drunk for many weeks successively.

* See *Medical Times and Gazette*, Vol. XVIII., 1859, p. 648.

Case V. I. J.—*Male, æt.* 32; *no hereditary predisposition; attacks commenced at æt.* 31, *apparently from gastro-hepatic derangements; they were preceded by muscular "aura;" and the latter could be arrested by elongation of the muscles. Mental condition unimpaired; motility considerably over-active; general health and strength reduced by treatment. Recovery; no fit for seven years.*

§ I. Male, æt. 32; moderate height; stout before illness, and of great strength.

§ II. A. Has lived in the country as steward; has had much out-of-door exercise, and a good deal of anxiety. Temperate in habits; has lived well. Used to smoke much, but does not do so now.

B. Previous health remarkably good; was stout and strong: capable of going through much work, and this without fatigue.

C. Married, at twenty-nine years of age.

D. No hereditary predisposition to nervous disease.

§ III. In November, 1852, his stomach was out of order; he felt sick, and had some bilious vomiting, when he suddenly experienced a dragging sensation in his left foot, as if it would be pulled up backwards behind his head; the foot jerked, and he took his boot off, but then became insensible; and was told afterwards that he had "had a fit." In this fit, which was epileptiform, he was very dark in the face, and much convulsed.

He was bled largely, and purged freely, by practitioners in the country. After this, he was put upon low diet, and ordered to take mercurial purgatives every night. He lost flesh rapidly, became pale, and felt sinking; was scarcely able to stand, and three months after the first attack, had another of similar character.

§ IV. A. *March 27th,* 1853.—Weighs two stones less than he did three months ago: face looks thin and haggard; he is depressed in spirits, and irritable in temper with "the doctors who have pulled him down."

C. Walks feebly, but does not drag either leg. Limbs firm, hands warm, feet cold.

D. Tongue clean; "subject to bilious attacks."

K. Frequently feels starting in foot and leg; always in the

same, the left; the leg begins to jerk, and to draw up behind him. This occurs sometimes when sitting, and he then gets up, fixes his toe with the heel of the other foot, or with a chair, and draws himself up, keeping the leg extended for a few minutes, when the jerking ceases. If he is on horseback, he immediately dismounts and adopts the same manœuvre, holding the thigh steady at the same time with his hands. The jerking begins in the foot, and goes upwards towards the trunk. He feels something wrong, very wrong, when this jerking begins, for he is sure, if it could not be stopped, he should have a fit. At present he has had only two, but he is in constant fear of them. Sometimes the leg draws up so forcibly, that he has to call others to help him in holding it down.

He has much general trembling and starting of the muscles, and frequent catchings in the leg which do not amount to that described above. He has also painful cramp in the toe of the foot on the same side. He starts much in sleep. No feeling of trachelismus; no syncopal feelings.

Mentally, with the exception mentioned above, he is well. His foot sometimes feels numb: he has neither headache nor vertigo. Before the attacks, he has been sleepy. Tinnitus aurium has occurred lately; his eyesight is weak, and he has nausea.

He has no attacks of "le petit mal;" in the severe seizures he did not bite his tongue.

§ V. He was ordered to take animal food twice daily, with malt liquor; to leave off mercurials, and keep the bowels regular with a simple saline aperient; and to take thrice daily the compound mixture of iron of the London Pharmacopœia.

The subsequent history of this case may be told in a few words. The attacks recurred two or three times, being always preceded by a jerking of the foot and leg, which he could not arrest. The latter was very apt to occur when he had been over-worked, or over-anxious; and indeed for three years he scarcely ever passed a week without being thus threatened. His general health improved; and since 1853 he has had no return of the severe seizures. Last summer he called upon me, looking well, and saying that he had felt quite well; but that the leg occasionally,—*i. e.* once in two or three months,—gave him warning of the direction in which his danger lies.

It is important to notice that this patient was in robust, vigorous health, when his attacks commenced.

The aura was here of the kind Herpin describes, viz. muscular clonic spasm.

Case VI. K. L.—*Male, æt.* 48; *without hereditary predisposition; suffered, at æt.* 47, *from abortive, syncopal seizures, preceded by violent pain in the feet or arms, and extending upwards like an epileptic aura. Symptoms of meningeal irritation. Improvement after taking mercury; giddiness relieved after taking zinc. Recovery; persistent for two years.*

§ I. Male, æt. 48, light complexion, yellow haired, thin, of nervous temperament.

§ II. A. Has been a coachman for many years; but for the last year and a half has kept a coffee-shop, and has felt the worry of it very much. Lives soberly, but well; rises early; attends to business all the day, and is very little outside his eating-room.

B. General health has been extremely good.

C. Married many years; has two sons married.

D. Father died at æt. 60, from accident. Mother living, and healthy, æt. 70. Ten brothers and sisters, all in good health, except one sister, who suffers much from headache, and who, as I had an opportunity once of observing, suffered from syncopal attacks, very closely resembling "le petit mal" of epilepsy. No gout in family.

§ III. A. Had recently changed mode of living in manner described.

B. In February, 1856, felt giddiness and confusion of ideas, with staggering in walk; pain and numbness in fingers and toes, and sometimes in arms, followed by trembling, panting respiration, huskiness in voice, and drowsiness.

C. These symptoms occurred on four or five days in the week, until the summer, when they disappeared for nearly three months, but returned in October, and have occurred several times a week ever since.

March 11, 1857.—§ IV. D. Tongue clean, and tremulous. Bowels open.

E. Huskiness at times; no dyspnœa, except at time of attack.

F. Pulse 80, soft and regular. Hands warm; apex of heart low; no murmur; action regular.

H. Urine contains much lithate, no albumen.

K. There is no subjective warning of the attacks beyond sometimes an undue languidness of limbs. When they occur, he feels pain, first in the finger, or ball of toe, or side of heel. It is "aching," as if the parts "had been frozen, and were coming to;" it is very severe, and he has to hold the limb; it extends upwards from the extremities towards the trunk; and then he feels sickness, and pants for breath; has a burning sensation across the chest; he feels sickly, and the heart palpitates violently. He has several times fallen down in these attacks. Afterwards he is sleepy, and sometimes sleeps for half an hour; sometimes he falls asleep two minutes after the pain has been severe. Sometimes he "loses himself" in these attacks, but not always. He invariably feels confused, and obliged to cling to objects for support. His wife can see, by his eyes, when the attacks are coming on. She thinks he turns pale in them. He has no feeling, and makes no sound of choking.

Mental condition, apart from the attacks, appears quite natural. His apprehension is clear, and his answers are rational. He has neither dreaminess nor reverie in the daytime, but sometimes calls out in dreams at night.

Without being always followed by attacks, he has pain often at the backs of the toe-nails,—the large toes, and the little ones. It is so bad that he has to take off his boot, and it makes him shiver. Sometimes the same kind of pain occurs in the wrists or fingers. The right toe is more commonly affected than the left, the left heel more commonly than the right. He has sudden pain, lasting for some seconds, ten or a dozen times a day: it is so bad that he cannot stand, and that the perspiration breaks out all over him.

Has not been subject to headache of late; but two years ago had much pain at back of eyeballs, and this was accompanied by vomiting. Sometimes "little bladders of water appear floating in the air" before him. He has hissing tinnitus, and slight deafness of the right ear. Head feels hot sometimes.

Muscular power generally is good, and equal on the two sides. No paralysis of face; no irregularity of pupils; no

deviation of tongue. Muscles of face tremulous: not subject to "cramp."

§ V. E. ℞. Hyd. c. creta, gr. iss.
Ext. hyoscyami, gr. j.
Ferri carb. c. saccharo, gr. iss.
M. Fiat pilula bis die sumenda.
℞. Extr. taraxaci, ℈j.
Infusi rhei, f. ʒiss.
Sodæ bicarb., ℈ss.
Tinct. hyoscyami, ♏xx.
M. Fiat haust. nocte maneque sumendus.

March 17.—§ III. Has had similar symptoms since last report. On the 13th was as bad as ever had been; fell against railings, shivered for twenty minutes afterwards, and felt excessively weak. On 14th, pain in toe. Yesterday, felt faintness and giddiness, but lay down, and the feeling went off. Bad headache during attack; "heavy pressure across forehead;" does not think he could see when the attack occurred.

§ IV. D. Tongue, thin white fur. Appetite as usual. Bowels regular: no deviation of tongue.

F. Pulse 94: regular, soft, moderately full, sharp.

K. In no pain, but feels languid. Little dimness of sight. Pupils large.

§ V. E. Pergat.

March 20.—§ III. Had a fit last evening, but thinks he did not quite lose consciousness: knew what he was about, but could not move; fell backwards, shivered much afterwards; and,—

§ IV. K. To-day limbs ache. Pain in foot never occurs when lying down. Right eyebrow higher than left, but eyelids equally open; lines on left side of face take same course as on right, but are more deeply marked.

F. Pulse 88, while sitting, firm, regular.

D. Tongue moist, with a little creamy fur on dorsum.

March 24.—K. Has been better in regard of pains, but this morning much pricking and tingling all over body. Head feels oppressed.

D. Gums tumid and red. Salivary glands enlarged.

§ V. E. Omitt. hydrarg. c. creta.
Pergat in usu ferri, et mist. aperientis.

April 6th.—§ III. Yesterday week, and also yesterday, had

giddiness and fainting feeling; but has had much less pain, and feels stronger. Gums a little tender.

§ V. E. Hydr. c. creta, gr. j.
Fiat pilula alterna quaque nocte sumenda.

April 28.—§ III. Up to the 24th, comparatively speaking, well; had very little pain, and only twice slight and transient giddiness. On the morning of 24th was loth to get up, and had much pain in toes when he did rise; limbs were heavy and languid. On 26th giddy, dazzling before eyes; pricking and numbness in tongue, with trembling of lips, mental confusion, and feeling of falling; pain in right toe and left heel, and great discomfort for ten minutes, then better again.

§ IV. A. To-day pretty well.

§ V. E. ℞. Ammon. bicarb., gr. iv.
Tinct. hyos., ♏xx.
Mist. camphoræ, f. ʒj.
M. Pro haustu p. r. n. sumendo.

May 5.—General improvement: has felt relieved by taking ammonia draught.

May 10.—Continues better; but pain and threatenings occur every now and then.

Hydr. iod., gr. i., omni nocte.
Pergat in usu ferri, et mist. aper.

June 9.—Has been well, with exception of very slight threatenings for a month.

June 16.—§ III. On the 12th some return of giddiness, and loss of power.

June 23.—Several times pain in right large toe-nail; always relieved by lying down.

June 30.—When pain is severe toe looks red, and perspires much. It is not tender afterwards. He has some pain in back of his neck.

§ V. E. ℞. Extr. colch. acetici, gr. iss.
Hydr. c. creta, gr. i.
Fiat pil. h. s. o. n. s.
℞. Mist. ferri comp., ʒj.
Fiat haustus, t. d. s.
Appl. empl. cantharidis nucha.

August 20.—§ III. Until within the last few days has been pretty well, but now pain has returned in the foot, and,—

§ IV. K. It is so bad he has to keep it up all the day.

§ V. E. Extr. cannabis Ind., gr. ½.
Fiat pil. ter quaterve die sda.

August 29.—§ IV. Has taken four pills a day, but the pain is just as bad when the foot is put down. He has slept better at night, but has had much cramp in the legs. The pain in the ball of toe is now, § IV., burning and intolerable; he can do nothing. This morning he had a little panting, and "queer feeling in the chest," followed by perspiration. There is pain at the back of the eyes; but none in the neck or spine.

§ V. Hyd. c. creta, gr. iss, extr. hyos., gr. j.
Fiat pilula bis die sumenda.

September 2.—§ IV. Some improvement, slight mercurial fœtor perceptible.

§ V. Habeat pil. i. quotidie.

September 12.—§ IV. Pain very severe again: salivary glands swollen.

§ V. ℞. Potassii iodidi, gr. iv.
Infus. calumbæ, f. ℥j.
Tinct. ejusdem, f. ʒj.
M. Fiat haust. bis die sumendus.
℞. Olei morrhuæ, f. ʒij. bis die sumendas.
To go into the country.

October 15.—§ III. For a week after going away could not put foot to the ground; the attempt to walk "brought on a fainting fit." Gradually pain has left him, and he has been much better in every way.

§ IV. While talking to me he exclaimed, "Oh! I have one of those fits coming over me." His face flushed, and became dark, but not livid; the conjunctivæ were suffused, and the pupils slightly dilated. There was no visible spasm, but his tongue moved about in the mouth; the respiration stopped for a few seconds at the end of inspiration, and was then, as it were, let go again. His hands perspired, tears ran over the cheeks; but there was no shudder, nor palpitation of the heart. Pulse regular, and more frequent than a few minutes afterwards. He could not speak for a few seconds, then the power returned; he did not clip his words, but said that his "tongue felt stiff and scalded." His respiration became somewhat sighing, but he felt no chilliness nor trembling, and no pain. This was, he said, "a very slight attack."

November 30.—§ III. Felt so well a fortnight ago that he discontinued all medicine. Since then has had a few threatenings.

December 15.—Occasional slight giddiness only; looks well.

§ V. E. Zinci. oxydi, gr. iv.
Saponis Hisp., gr. i.
Fiat pil. bis die sumenda.

January 15, 1858.—Is in fair health.

February 4.—Continues well, and may discontinue medicine.

December 19.—Called to report progress. Has been well, with the exception of very occasional swimming feeling.

Occasionally after fatigue feels slight pain in foot. Looks well, and feels "better than ever expected to be." Memory good; appetite healthy; bowels regular; tongue clean and moist; pulse 80, moderately full and firm.

Since this report I have several times seen him, but the only occasion for his calling upon me has been to say that he was quite well.

The points of interest are—

I. The existence of a kind of aura, painful in character, before the attacks.

II. The absence of any clear evidence of loss of consciousness during the attacks.

III. The curious combinations of symptoms which remove this case from the category of true epilepsy, although in many points it offered considerable resemblance thereto. It is not, of course, included in the eighty-one cases analysed in this work: I have introduced it in detail because it illustrates some features of a closely allied convulsive disease.

I return now to *b*. The actual symptoms of the attack,—*proper paroxysmal phenomena*. It is impossible to describe the fully-developed paroxysm of epilepsy without dividing it into three stages or periods; during each of which there are special phases of spasmodic movement, mental condition, and physical or organic functions.

In the *first* stage of the attack, there are the following phenomena, which occur—not successively, as they are necessarily represented in writing, but—simultaneously, or with slightly varying order:—

Complete loss of perception and volition.

Tonic contraction of the muscles, usually with predominance on one side.

Impeded respiration, with or without noise in the throat.

Pallor, or duskiness of face; or the former rapidly succeeded by the latter.

Dilated pupil, distorted features, distending veins.

Weak or imperceptible radial pulse, with throbbing carotids.

In the *second* stage the symptoms are these:—

Persistent unconsciousness.

Clonic convulsion; general, or predominant on one side.

Laborious respiration, with tracheal gurgling, foaming, or hissing.

Darkness of face and body generally, with cold and often profuse sweating.

Oscillation of pupil, champing of jaws, emptying of veins.

Pulse throbbing, palpitation of heart.

In the *third* period, which rises gradually out of the second, and is not separated from it by any abrupt transition, there are the following phenomena:—

Partial return of perception and volition, the patient appearing as if angry or alarmed, and gradually becoming drowsy.

Muscular movements not meaningless, but apparently half voluntary, or sensational.

Respiration laboured, with gurgling noises, and moaning.

Surface dusky, and perspiring.

Pupil contracted, conjunctivæ injected.

Pulse full and rapid, but variable.

From this third stage the patient may gradually recover, or he may pass into a more or less profound stupor, constituting the after-stage.

Upon the foregoing stages and their several phenomena, some comments are needed. In the present section, however, no attempt will be made to explain them, as such explanation will be given in the chapter on Pathology, § IV., the mode of production of the symptoms.

The *loss of perception and volition* is usually instantaneous and complete, but this is not invariably the case. Sometimes tonic spasm commences in the face or neck, producing distortion of the features; and the individual retains volitional power just long enough to sit or lie down. At other times, no matter what he may be doing, he falls, without any power to save himself

from injury, and without any subsequent recollection of anything, sensational or mental, which occurred immediately before the attack.

Again, at the commencement of an attack, *i. e.* at the first two or three seconds of its existence, although all active volition may be suspended, so that the individual is totally unable to exert any voluntary power, or to repress any involuntary movement, he may yet retain some perception, both of internal conditions and of external impressions. He may remember something which was said or which occurred after he had lost voluntary power, and also some definite or indefinite sensation of which he was conscious. Usually, however, and I believe invariably, there is more or less obscuration of the intellect during this period: enough remains, and is remembered, to show that all was not lost; but so little and so indefinite are the indications and reminiscences, that they prove much more to have been lost than retained.

Together with perception, sensation is held in abeyance; but it appears that, although this is the case, the receptivity of the peripheral expansion of the nerves is not seriously interfered with, for reflex actions may be excited by appropriate stimuli. Thus Romberg says a dash of cold water will produce the "same starting of the body as it does in a healthy individual."*

During the second stage of the attack, perception and volition remain as in the first; but the third stage is marked by a change in their condition. Some perception and volition return, for it is evident now that the patient feels, and that the feeling passes on into idea. Watch his face, and you see anxiety, suspicion, or terror. His brow is knit; he struggles with the evident purpose of releasing his hand or foot from the grasp of a bystander; he looks at those around him; he moans, or groans, or utters half-intelligible, half-articulate words. If you pinch the skin, he withdraws the hand, and looks annoyed; if, as often happens, salt or other sapid substances have been placed in the mouth, he rejects them by a voluntary effort. He alters his position; stands up; takes off his coat, or does other things which display volition, and the capacity for its exercise.

* Manual, Vol. II., p. 199.

But the recollection which he has of all that may have occurred is very confused, or absolutely *nil*. Gradually the mental state may pass into that which is habitual, and the patient resumes his occupation prior to the attack; or, as happens in many cases, the individual appears stupid and heavy, and falls into a more or less profound stupor.

The *spasmodic element* in the attacks is very peculiar in its characters. During the first period there is a tonic contraction of certain muscles, or groups of muscles; and this is so located, and distributed in such proportion, that the effects generally witnessed are—drawing round of the head to one side; throwing backwards of the trunk and arms, and extension of the legs; together with distortion of features, and absolute arrest of respiration. It commonly happens that the contraction is not a perfect specimen of tonic spasm; and that it is more marked on one side, or in one series of muscles than in another: so that the effect is not an even, but a somewhat jerking traction of the trunk and extremities in one direction; and this direction is commonly, but not invariably, the same in the same individual.

In some cases it appears, that during the first stage of an attack, and while perception and volition are—so far as can be ascertained afterwards—in abeyance, certain automatic movements occur, prior to the development of the tonic spasm. Thus Foville says that he has seen an epileptic who uttered a cry, and then commenced "pirouetter sur elle-même, avec une grande vitesse, en faisant convulsivement d'innombrables signes de croix."* Portal mentions a similar phenomenon, the patient making "plusieurs tours de chambre;"† and similar events have been witnessed by myself. These movements occur, I think, during that period of altered consciousness which has already been described: the patient experiences some profound alteration from the ordinary condition of health; but it is not so profound as to destroy altogether *pro tempore* the results of previous education and habits. When, however, the first stage is fully established, there is, for the time that it lasts, such absolute destruction.

* Dict. de Méd. et de Chi., art. Épilepsie, p. 415.

† Observations sur la Nature et le Traitement de l'Épilepsie, p. 127.

The particular locality which may be the seat of tonic spasm is not the same in all cases; commonly all the muscles are more or less affected; but some exhibit the spasm before others. My own experience coincides with that of Dr. Watson, who states that "in most of the fits, in which I have happened to see the commencement, the first effect of the spasm has been a twisting of the neck, the chin being raised, and brought round by a succession of jerks to one shoulder."* In some cases, however, I have seen the patient, after this traction of the head has commenced, put down an object which he happened to be holding in the hand, and move from one chair to another; or if previously standing, he has been able to sit down.

The intensity of the tonic spasm varies much. I have seen it so slight that the limbs might be readily flexed; and so severe that the most violent opisthotonos was present. Tissot says that "les cheveux s'hérissent;"† and Esquirol mentions the same phenomenon.‡

The commencement of the second stage is marked by the relaxation of tonic contraction, and the commencement of clonic spasm. There is now champing of the jaws; dragging backward and forward of the neck and facial muscles; alternate flexion and extension of the limbs, and jerking movements of the trunk. The respiratory movements become convulsive, and at the same time there are rumbling noises in the intestines, evacuation of the bladder, rectum, or vesiculæ seminales. Erectio penis occurs during the tonic stage, but emissio seminis during the clonic; hiccup and vomiting may also be present. Now also, as Tissot observes, "la peau chevelue et le front sont excessivement agités;"§ the distortion of countenance is perfectly hideous; and the limbs are agitated by movements of a perfectly unmeaning character;—*i. e.* they resemble no ordinary voluntary efforts, and appear to accomplish no purpose.

With regard to the distribution of convulsive movements, there are conflicting statements among authors. Romberg, for

* Lectures, ant. cit., Vol. I., p. 625.

† Traité de l'Épilepsie, p. 3.

‡ Traité des Maladies Mentales, Tome I., p. 275.

§ Traité de l'Épilepsie, p. 3.

example, says, that they are more often general than limited;* while Dr. Sieveking states that they "generally show a predominance on one side;"† and Dr. Prichard is of the same opinion.‡ So far as my own observation extends, I have never seen a case of genuine epilepsy in which the convulsion was limited to one side; but I have almost constantly noticed that one side was more affected than the other, and that there was such a predominance of convulsion in one lateral half of the body, that the trunk and limbs moved during both the tonic and the clonic stage from the left towards the right, or *vice versâ*. In the convulsions of uræmia, or of organic cerebral disease, however, it is common to observe the spasms actually limited to one lateral half of the body, or even to one limb; and I remember, in one curious case of uræmia, being able to determine the side in which the convulsions should occur; and also to drive them from one side to the other alternately, by exerting pressure upon the carotid artery of the left, and then of the right side.

When the second stage of an epileptic fit is passing off, or into the third stage, the clonic convulsions cease, and in their place we notice automatic movements. The patient makes an attempt to change the posture; to rise up; take off some article of dress; or to grasp an object near him. Such automatic movements may be occasionally interrupted by clonic spasm, but the latter becomes more and more rare, and the convulsion may soon be regarded at an end.

The condition of the function of *respiration* differs during the several stages of an epileptic paroxysm. Generally speaking, the respiratory movements cease during the tonic stage; they are violently or convulsively performed during the clonic; and they become laborious as the patient recovers, or passes into the after-stage of coma.

In seven individuals who experienced attacks of "le haut mal," it was positively asserted to me by their friends,—whose attention I specially directed to the inquiry,—that there was no cessation of respiration. Upon this statement, however, I place

* Manual, aut. cit., Vol. II., p. 199.

† Epilepsy and Epileptiform Seizures, p. 4.

‡ Treatise on Diseases of the Nervous System, p. 89.

no such reliance as to use it in reference to the pathology of the disease, or to the mechanism of an attack; but it is of importance to know that sometimes the evident interference with respiration is so slight as to escape observation.

Prior to the arrest of respiration there is, in some cases, and I think in very many, an inspiratory movement of variable duration. It is soon followed by the tonic spasm.

The arrest of respiration is sometimes instantaneous, and absolutely synchronous with loss of volition and perception. At other times it is not so, some movement continuing after consciousness is lost, as is proved by the existence of the so-called "epileptic cry;" the latter being present without any subsequent recollection of its occurrence on the part of the patient; and, therefore, presumptively during the time that consciousness is lost. Usually the cry is uttered at the very commencement of an attack, and is then followed by the arrest of respiration. It is by no means a common occurrence, and is demonstrably present in not more than half of the cases. Thus M. Herpin states, that in thirty cases it was constant or nearly so in nine; it was exceptional in six; it was positively absent in thirteen, and doubtful in two.* M. Brown-Séquard states that loss of consciousness either accompanies or precedes the cry;† but from one interesting case of epileptiform convulsion which has fallen under my own care, I am convinced that the cry may occur before the loss of consciousness. The individual referred to was aware that he was making the noise, but he could not arrest it; he heard remarks made in another room, and made signals to his child to leave the room; but then lost all perception and volition.

During the second stage of an attack, the respiratory movements are convulsively and violently performed; the chest heaves; the muscles of forcible respiration are brought into play; the alæ nasi dilate and expand, and the general aspect of the patient is that of a struggle for breath; the diaphragm may be felt convulsed through the abdominal walls;‡ and the orbicularis oris may so compress the lips as to impede the

* Du Pronostic, &c., ant. cit., p. 428.

† Researches on Epilepsy, p. 75, &c.

‡ Reid, Transactions of King's and Queen's College of Physicians, Ireland.

entrance of air by the mouth. The latter cause of difficulty I have witnessed to be extreme in one case; the respiration being at once rendered comparatively easy by drawing down the lower lip.

In this stage, as well as in the third, the respiratory obstruction is notably increased by an excess of secretion into the trachea and bronchial tubes; but in the third stage the appearance of the patient alters; there is not the struggle for breath any longer; the respiration becomes slower, and its character is that of an occasional, long, violent, snorting inspiration, followed by a prolonged pause. This condition continues until the stupor of the after-stage sets in.

The *colour of the face*, formerly described almost invariably as being dark and livid, has had much attention directed to it of late by M. Trousseau, Dr. C. B. Radcliffe, and M. Brown-Séquard. Dr. Cooke stated in 1823 that in epilepsy the "face is very pale, or else livid, or almost black;"* Godwin wrote in 1769, "Accesione appropinquante primum omnium caput affici solet. . . . vultus tumere, interdum pallere."† M. Delasiauve regards *pallor* as "un caractère propre aux accès épileptiques;" ‡ Dr. Radcliffe says since Trousseau pointed it out, "I have seen it [pallor] in all the instances, now amounting to twenty-one, in which I have seen the fits from the very beginning." § Dr. Sieveking, in describing the attacks, says that the patients are "at first pale;" ‖ and M. Brown-Séquard, throughout his later writings, speaks of pallor as being more or less constantly present at the very onset of the attacks.¶

My own experience on the matter is by no means so uniform; I have watched attacks from the very commencement; they have occurred while I have been looking out for them, but they have come on without any change of colour until the facial muscles were distorted, and then a dusky flush has appeared. I can therefore speak confidently of the absence of

* History and Method of Cure, &c., ant. cit., p. 12.
† Disputatio de Epilepsia, p. 2.
‡ Traité de l'Épilepsie, p. 56
§ Epilepsy and other Convulsive Affections, p. 145.
‖ Epilepsy and Epileptiform Seizures, p. 3.
¶ Researches on Epilepsy, p. 75, &c.

pallor in some instances; whereas in others it has been sufficiently obvious, not only to attract my own attention, but that of the friends of patients.

In forty-five cases I have records upon this point; in some instances the observations have been my own, in others those of one, two, or more intelligent friends, specially questioned upon the matter. The numerical frequency is as follows:—

Colour during the Fit.	Males.	Females.	Total.
Dark	17 ...	14 ...	31
Pale	5 ...	7 ...	12
No change ...	2 ...	0 ...	2
	24	21	45

From this it appears that pallor was observed in but little more than one-fourth of the cases; and either darkness or no change in nearly three-fourths. And further, that pallor is much more frequent in the female than in the male sex, the numbers being respectively thirty-three and twenty per cent.

When pallor, however, does occur, it is either during the first stage, or immediately antecedent to the occurrence of tonic spasm. As the tonic spasm continues the face and surface generally become flushed, and then of slate tint; or they may exhibit no flush, but deepen in darkness, until the second stage is arrived at, when there is commonly notable lividity. This lividity often increases during the early part of the second stage; and it reaches its maximum just as the clonic spasms are beginning to fail in vigour, and the patient exhibits some return of consciousness, by the performance of sensational or automatic movements. In the third stage the tint is a dusky pallor; together with injected conjunctivæ, and occasionally with petechial spots about the face and neck.

The condition of the *iris* during the first stage of an epileptic paroxysm is invariably, so far as my own observation extends, that of dilatation. In one case a momentary contraction preceded the dilatation. The pupil enlarges before or at the very commencement of the tonic spasm, and it increases until little of the iris is visible. Once, while I was talking to an epileptic, and observing his eye, a fit commenced: the eyes rolled up-

wards and to one side, and the pupils dilated. He had, however, after this evident dilatation, sufficient power left to say, "I am going to be ill;" and it was not until after he had uttered these words that the distortion of the face commenced. Having a bottle of chloroform in my hand, I instantly applied some to his nostrils, with the effect that the pupils contracted, the facial spasm relaxed; he looked at me, and, in a half-bewildered manner, asked, "Have I had an attack?" Here the order of events was—dilated pupil, with traction of eyeball; distorted features; loss of consciousness. In another case where I observed the onset of numerous attacks, the same order of events occurred, but several attacks were apparently arrested by placing ammonia near the nostrils. Just, then, at the very moment of commencing dilatation of the pupil there is an inspiratory movement, but it is for a moment only; neither the chloroform nor ammonia will produce the slightest effect if their application is delayed.

During the second stage of an attack the pupil varies. As a rule, I believe, it is less dilated than during the first stage; but it may suddenly contract and then as suddenly enlarge; or it may oscillate between moderate limits of expansion and contraction.

When the third stage is arrived at the pupil generally becomes smaller, and, as I have often seen, contracted to a mere point. In other cases it regains, during this stage, its ordinary dimensions.

The *pulse* exhibits notable variations during an epileptic paroxysm. In the first stage, or early period of an attack, it is, according to the prevailing experience of authors, "small:" the condition as to strength appears less constant. Thus Aretæus says it is vehement, quick, and small.* Tissot states that "dans les commencemens, il est petit."† Esquirol's evidence is that it is "d'abord petit;"‡ Portal's, that it is convulsive, irregular, and more frequent;§ while Dr. Cooke says that "in the beginning of the paroxysm the pulse is small and often irregular."‖ Dr. Reid makes the statement that "the first

* Extant works of. Syd. Soc. Transl.

† Traité de l'Épilepsie, p. 11.

‡ Des Maladies Mentales, Vol. I., p. 276.

§ Traité de l'Épilepsie, p. 135.

‖ History and Method of Cure, &c., ant. cit., p. 16.

symptom is the suspension of the action of the heart, and consequently an intermission of the pulse, which may continue from a few seconds to about three minutes."* Dr. Watson states that the pulse "sometimes ceases to be tangible at the wrist during the height of the fit;"† and Dr. Radcliffe says, "At first the pulse may be almost silent, and the action of the heart very feeble."‡

The results of my own observations upon the pulse during epileptic seizures may be stated thus:—1. That in some individuals it may be felt throughout the paroxysm, and that without presenting evidence of any notable change in force, fulness, or frequency. 2. That in other cases it becomes, at the onset of the attack, much diminished in fulness; but that during the clonic stage, it increases in that quality, and is tumultuous in its beating. 3. That sometimes during the first stage the radial pulse may be absolutely imperceptible; but that, at the same time, the heart acts regularly, and the carotids throb violently: and during the second stage there is great fulness of the pulse, and tumultuous action. 4. That sometimes, owing to the convulsive movements, it is quite impossible to determine the condition of the pulse; and 5. That during the third stage, of an attack of "le haut mal," there is almost invariably throbbing and full pulse, with violent palpitation of the heart.

It is interesting to place on record here an observation which I once made on a child during an epileptiform convulsion, inasmuch as it points to the relation between the vascular condition and that of the iris. The child was seen in a fit; the pupil was extremely dilated; the radial pulse excessively weak. During the same time, however, the heart was acting well, and a murmur,—dependent, as I subsequently found, upon malformation,—was audible over the præcordial region. My finger was on the pulse, and I was watching the iris, when suddenly and simultaneously the pupil contracted, and the radial pulse filled. The præcordial murmur, however, underwent no change in quality, force, or rhythm.§

* Transactions of King's and Queen's College of Physicians, Ireland, Vol. IV., p. 361.

† Lectures, Vol. I., p. 626.

‡ Epilepsy and other Convulsive Affections, p. 147.

§ Trans. of Pathological Society, Vol. VIII.

There are some occasional *extrinsic phenomena* which occur during an epileptic paroxysm, and require, therefore, a few moments' consideration. Herpin mentions lachrymation as observed at the commencement of some attacks;* and Hasse relates the same occurrence.† Tissot states that he observed "chez deux malades une odeur cadavereuse insupportable;"‡ and Dr. Prichard has noticed the secretion of urine to be "pale and copious."§ The copious secretion of urine has been the only one of these phenomena which I have observed: but it has been occasionally a highly-marked symptom. It has occurred in the male sex as well as in the female. My observations on the quality of the urine agree with those of Hasse; I have never found sugar to be present, nor have I discovered albumen except in cases of Bright's disease of the kidney. Immediately after an attack both the water and urea appear to be increased, and deposits of uric acid and of urates have been discovered.‖

The length of time occupied by an epileptic paroxysm varies much; but the statement of Dr. Watson, that it ranges from five to ten minutes,¶ or of Esquirol, that it lasts from five to fifteen minutes,** is sufficiently accurate. Generally, I believe, the lower number of minutes would be found nearer to the truth than the higher.

(*c.*) The *after-symptoms* of the epileptic paroxysm vary much in character, severity, and duration.

Their general character is that of stupor or profound sleep, into which the patient gradually passes from the third stage of the attack. If undisturbed, both perception and volition are more or less extinguished for the time; but the patient may be roused, although with difficulty, from this condition; and herein his state differs materially from that of the attack. If roused, he is stupid and confused, and soon lapses again into sleep; or he is peevish, and irritable, and disposed to suspect some injury. If undisturbed, the sleep is very com-

* Du Pronostic, &c., p. 428.
† Virchow's Handbuch, 1st^{e} Abth., Band IV., p. 251.
‡ Traité de l'Épilepsie, p. 5.
§ Treatise on Diseases of the Nervous System, p. 89.
‖ Parkes on Urine, p. 313.
¶ Lectures, Vol. I., p. 627.
** Des Maladies Mentales, Vol. I., p. 280.

monly profound, but tranquil; while occasionally the patient appears worried with dreams, and mutters unintelligible words.

Sometimes the paroxysm occurs without any subsequent stupor, but this must be regarded as exceptional. So far as my own observation extends, I have not seen in the male sex a single case of genuine epilepsy, in which attacks of "le haut mal" were entirely free from this after-symptom. In the female sex I have observed one case, without being able, however, to account for the absence. The attacks, in this instance, occurred frequently, and were severe; they had existed for forty years, but the patient's intellectual condition was good. Dr. Bucknill has remarked, and my own observation coincides with his, that it is common to observe an absence of coma in those lunatics who are subject to epilepsy.*

The stupor which follows an epileptic paroxysm may be trifling, or very profound; and its duration varies from a few minutes to several hours; ranging, however, most commonly between thirty minutes and an hour and a half; the mean of numerous observations on both sexes being one hour. Hasse states that the duration is in proportion to the severity of the paroxysm,† but I have not been able to confirm the accuracy of this statement.

During the stupor in simple epilepsy, the muscular condition is that of relaxation. There is neither paralysis nor rigidity, but simple flaccidity, occasionally interrupted for a moment by clonic spasm, or fibrillar contraction.

The condition of respiration is sometimes that of normal sleep; whereas, at other times, it is that of profound coma. Stertor is present about as often as it is absent; so that no diagnostic importance can be attached to the mere presence of this sign. When present, however, it is of deep guttural tone, differing therefore from that of uræmia; and moreover, it is capricious,—ceasing for a few moments, and again reappearing; —and further it may be removed by shaking the patient, so as partially to rouse him, differing therefore from that of hæmorrhagic apoplexy.

* Asylum Journal for October, 1855.

† Virchow's Handbuch, ant. cit., p. 255.

Tho pulse and respiration-ratio undergoes in some cases sudden and notablo variations. Thus in one case I counted in four successive quarters of a minute, 22, 27, 18, 22 pulsations; the respiration being but 12 in the minute; but varying in such way that sometimes there were three respirations in three seconds, and then a pause for twelve or fifteen seconds, and so on. The ratio of respiration to pulse varied from 1 : 5 to 1 : 5·5, occasionally reaching 1 : 4. (See Case IX.)

During coma the skin is often bathed in perspiration, and of very variable temperature and colour. I have seen it pale and of dusky tint in some cases, but florid in others. Sometimes the surface is cold and moist, but at other times I have observed the forehead and chest hot, and steaming.

The condition of the pupil differs in different cases, and it may be found contracted, of medium size, or dilated; but it has occurred to me to find it most frequently contracted during the after-stage of an epileptic paroxysm.

2. *Epilepsia gravior, without complete loss of consciousness, or epilepsia abortiva.*—Dr. Prichard says, "I have seen cases in which, on the most attentive and careful examination, it appeared that a degree of consciousness remained during the whole paroxysm."*

M. Doussin Dubreuil says, "Il est des cas où l'ame conserve entièrement ou en partie ces deux facultés (la raison et le sentiment), quoique le corps éprouve divers mouvemens et diverses agitations."† Van der Kolk, "In some cases, of which I have observed several examples, no loss of consciousness takes place."‡ M. Maissonneuve relates four curious cases, of which the following is a brief summary:—1. The case is that of a girl twelve years of age, who, six months after a fright, was seized with cramp in the left foot extending upwards toward the trunk, and taking away her power of maintaining equilibrium, "mais non la connoissance." This occurred for four or five days successively; was then absent for twelve months, when the symptoms reappeared; and again, after a pause of nine months, recurred in the same manner as before,—the cramp occasionally commencing in the arm. With regard to this case, M. Mais-

* Treatise on Diseases of the Nervous System, p. 91.

† De l'Épilepsie en général, p. 18.

‡ Pathology of the Medulla Oblongata. Syd. Soc. Trans., p. 211.

sonneuve remarks :—"Tout annonce que cette maladie dégénérera en épilepsie sympathique, et que les accès ne tarderont pas à se compléter par la perte de connoissance."*

2. The second case was that of a woman, æt. 70, who from twenty-eight years of age had suffered attacks, every two or three months, in which "elle éprouva, sans cause connue d'abord, un tremblement universel, et ensuite des convulsions de tout le corps sans perte de connoissance." †

3. A man, æt. 23, who suffered similar attacks, who experienced a sensation of a ball rising towards throat, "où elle cause une espèce de strangulation, alors chute avec cris, mais sans perte de connoissance." ‡

4. A woman, æt. 24, in whom attacks recurred frequently, in which the respiration was "stertoreuse et convulsive," the face became red, and its veins, as well as those of the neck, were distended, but in which consciousness was not lost for a single moment. §

With regard to these cases, M. Maissonneuve remarks that the first is one of undoubted epilepsy; that the second is questionable; and that the third and fourth may be considered as hysterie; the principal reason for turning such cases over into the category of hysteria being the sensation of globus hystericus. For my own part, I am content that such cases as the latter should be placed, at all events *pro tempore*, among the hysterie; but the two former are interesting examples of convulsive movements, in many points resembling epilepsy, but differing therefrom in the retention of consciousness.

Dr. Radcliffe gives the details of an extremely interesting case in which the patient "never lost his consciousness," although attacks of notably epileptiform character occurred. For example, "The face was first pale, then lurid, the features were drawn, the eyes fixed, . . . the face twisted round, . . . the chest immovable, . . . the right arm rigidly contracted and agitated by slight convulsive shocks, . . . vision greatly troubled. After the attacks, his countenance had a flushed and jaded expression." ‖

* Recherches et Observations sur l'Épilepsie, p. 22.
† *Ibid.*, p. 22. ‡ *Ibid.*, p. 25. § *Ibid.*, p. 33.
‖ Epilepsy and other Convulsive Affections, p. 154.

M. Herpin, in his enumeration of the symptoms of epilepsy, describes various forms of alteration in sensation and intelligence falling short of complete loss of perception and volition; but he remarks, "Malgré les exceptions nombreuses signalées dans ce tableau, la perte absolue des sens et de l'intelligence n'en reste pas moins un symptôme qu'on rencontre chez la grande majorité des malades."*

M. Brown-Séquard has described certain attacks which he has witnessed in animals, and which he appears disposed to term "spinal epilepsy," from the fact that convulsions are limited to the posterior limbs, or to parts below the seat of a spinal injury; sensibility and consciousness remaining intact. He says, "On voit les deux membres postérieurs se raidir tétaniquement, puis être atteints de convulsions cloniques violentes, désordonnées."†

It has occurred to myself to observe five cases in which there were attacks, more or less epileptiform in character, but without the loss of consciousness. In one of these, the symptoms were those of sudden tonic contraction in the muscles of the face and neck; with suffused face, embarrassed respiration, twisting of the head, and slight tremulous rigidity of the arms: the whole lasting from three to five seconds; and the patient not only affirming afterwards, but evidently exhibiting at the time, persistent consciousness. In another case, twitching of eyelids and mouth, and shaking of the limbs, occurred suddenly about once a week for between three and four years; the movements of the lower extremities were so violent that the patient was thrown down by the attacks; but in no one of them did he ever lose consciousness. There were, however, other symptoms in this case which made me refuse it a place among the cases for analysis as examples of epilepsy. The first case mentioned was excluded for similar reasons; but a third, in which the phenomena were less marked, is included among the epileptics, inasmuch as the patient presented, besides these abortive seizures, other paroxysms of the fully-developed epileptic character.

* Du Pronostic et du Traitement, &c., p. 429.

† Journal de la Physiologie. Tome I., No. 3, p. 474.

In a fourth case there occurred many times in the day tonic contraction of the muscles of respiration and of the face, with duskiness of skin, suffusion of the eye, and an expression of countenance as if crying, or about to cry;—incapability of speech, but no loss of consciousness; yet, notwithstanding the absence of this symptom, the patient, previously an intelligent professional gentleman, aged forty-eight, has gradually failed, and that considerably, in mental capacity.

A fifth case,—but one which, for reasons already assigned (p. 103), is not regarded as an instance of simple epilepsy,—presented a series of abortive seizures, which were preceded by a painful "aura," but were unaccompanied by loss of consciousness.*

* See Case VI., p. 98 *et seq.*

CHAPTER IV.

NATURAL HISTORY OF EPILEPSY.

"It (the physiology of the nervous system) is one of the cases in science where new conclusions and a nearer approach to truth are rendered possible, simply by recasting the order of facts, and using them in new combinations."—Sir Henry Holland.

It is questionable whether in the present state of medical science and practice we have the materials for forming an adequate natural history of epilepsy. Cases are so profoundly interfered with by treatment, and that of such different kinds, that it is often quite impossible to sever the phenomena of the disease from those which have been induced by well-, or ill-advised therapeutics. Again, from the chronicity of the disease, and its ordinarily stubborn character, patients are passed about from one physician to another, so that it is comparatively rare for the same individual to have had undivided control, or even trustworthy knowledge of a case from the beginning to the termination of its course. Much, therefore, depends upon hearsay evidence, and that with regard to events long passed: much is supplied by the friends of patients, whose judgment and capacity for observation are moulded and limited by deficient knowledge, preconceived opinion, and anxious emotion. We have therefore a combination of almost all sources of error, and the difficulty of avoiding their results is manifestly great. Still on some points the difficulty is less than on others; and on no one is it so great as to justify an omission of the attempt to construct the history. I shall, therefore, pass in review,—1. The general prevalence of epilepsy; *i. e.* its relation to diseases

generally, to affections of the nervous system, and to chronic convulsive diseases;—2. The causes of epilepsy;—3. The relations between its several symptoms, paroxysmal and inter-paroxysmal;—4. Its consequences;—and 5. Its complications.

I. General Prevalence of Epilepsy.

The cases furnished by my own private practice can give no answer to the question,—Is epilepsy a common disease?—because with regard to them a principle of selection has been at work; but among the out-patients of a general hospital no such principle operates, and from them information may be obtained.

Among 1820 patients whose diseases were examined, diagnosticated and registered by myself at the Westminster Hospital, there were 100 cases of nervous derangement; of these 46 were males and 54 were females. Of these 100 examples of cerebral, spinal, or other nervous malady, 34 were cases of convulsive disease, more or less liable to be confounded with epilepsy; 21 were males and 13 females. Out of these 34 cases 7 were examples of true epilepsy; and of these 4 were males and 3 females. True epilepsy, therefore, may be regarded as a rare disease among those who belong to the class of society furnishing the out-patients of a London Hospital. There were but 7 cases in 1820 invalids.

The frequency of epilepsy as compared with other diseases of the nervous system may be estimated on a larger scale by reference to those of my own private patients of whose cases I have preserved records.

Of 231 examples of nervous diseases, 115 presented convulsive phenomena, more or less resembling cases of epilepsy; but of these, 81 only were examples of true epilepsy; the others being distributed among organic diseases of the brain, eccentric convulsions, and the like.

It is evident from the difference between these proportions, and those given by hospital patients, that convulsive affections have been presented in undue frequency by my private patients: 49 per cent. of my cases of nervous diseases belonging to that category, whereas only 34 per cent. were of the same class

at the Westminster Hospital. Again, it is still more clear that cases of epilepsy must have been brought with undue frequency to me, since 34 per cent. of my private patients who were affected by nervous complaints, suffered from epilepsy; whereas only 7 per cent. of my hospital patients exhibited that disease.

Adding, however, the two series together, we have 331 cases of nervous disease: of these, 149 were examples of chronic convulsive affection; 182 were instances of other nervous maladies, not convulsive; and out of the 149 cases of convulsive disease, there were 88 cases of true epilepsy.

II. Etiology of Epilepsy.

In considering the causes of epilepsy, we have to separate from each other those necessary conditions to which every individual is exposed,—such as hereditary taint, age, sex, &c.; and those more or less accidental causes of disturbance, which many may escape,—such as mental over-exertion, emotional fright, &c. We are not justified, I think, in applying to these two groups of causes, the terms "predisposing" and "exciting;" or "remote" and "immediate;" for, although I fully admit that the particular organic state which has been already termed a "convulsive tendency"* differs from that which determines a "convulsive paroxysm," yet I do not think we are at present in a position to draw the line between those circumstances which induce the former, and those which,—the former being thus induced,—are the causes of the latter. The terms therefore which I propose to employ, are,—1. Unavoidable vital conditions. 2. Accidental conditions of disturbance; or, more briefly, unavoidable and accidental causes.

A. Unavoidable vital conditions.

Of these, the earliest that can come into operation is *hereditary taint*, or predisposition; and upon its importance there are conflicting opinions among authors. An anonymous author, of an old book, says quaintly enough, "There are many afflicted with this disease hereditarily, from the same diseasy principle in their parents, so that they bring it into the world with them; but upon general observation, it is a disease chiefly

* See p. 17.

occasioned by some posterous accident:"* but the current belief among ancient writers, and among many at the present day, is that epilepsy is pre-eminently an hereditary affection.

In 1845 M. Gintrac examined the question carefully, and concluded that the hereditary transmission of epilepsy was more rare than many thought.† M. Herpin, on the other hand, states, that there is "dans les familles des individus atteints d'épilepsie une proportion de cas de cette affection qui dépasse de beaucoup celle qu'on rencontre en général."‡ M. Herpin arrived at this conclusion, by estimating the number of epileptics per thousand of the general community, and comparing this with the number found among the products of two series of epileptic stock. In the former case there were 6 per 1000; in the two latter, 29 and 22 per 1000. M. Delasiauve states that of 300 cases, there was no information in 167; that there was a formal denial of hereditary taint in 120; whereas there was evidence of epilepsy in the relatives of but 5; and of allied cerebral diseases in only 8.§ If then we exclude the doubtful cases, 167 in number, M. Delasiauve's researches present evidence of hereditary taint in but 9 per cent. Dr. Sieveking found an hereditary taint in 11 per cent. of his cases.‖

In the cases which have come under my own observation, I have sometimes omitted to record the presence or absence of hereditary predisposition. In other cases, the question has been said to be doubtful; and in such it was doubtful because the patients, or the friends of the patients whom I saw, could give me no definite and positive information either way. But in regard of thirty-eight individuals,—viz. twenty-two males and sixteen females,—I have accurate information. In some of these, antecedent relatives were affected with convulsions, or with other notable cerebral diseases; in others, collateral relatives exhibited nervous derangement: while in a third group no family tendency to nervous malady could be discovered.

* A Treatise of Diseases of the Head, Brain, and Nerves. By a Physician. 1719. P. 53.

† Mémoires de l'Académie Impériale de Médecine, 1845.

‡ Du Pronostic, &c., p. 328.

§ Traité de l'Épilepsie, p. 189.

‖ Op. ant. cit.

The results of this inquiry may be represented by the following table:—

Nervous disease.		Males.		Females.		Total.
Positively absent in the families of		15		11		26
Present in		7 viz.		5 viz.		12
Antecedent	Mother, paralytic ...	1	Mother, insane ...	1	2	6
	Mother's sister, fits	1	Father, fits	1		
	Mother's sister, idiotic	1	4			
	Mother's sister, fits	1				
Collateral	Brother, maniacal ...	1	Brother and nephew, idiotie, with fits ...	1	3	6
	Brother and sister, cerebral disease ...	1	3 Maternal, first cousin, fits...	1		
	Brother, fits ...	1	First cousin, fits ...	1		
		22		16		38

From this table it is apparent that hereditary, or at all events family, proclivity to nervous disease is present in 12 of 38 epileptic individuals, or in 31 per cent.; and further that the tendeney is equal in the two sexes—7 : 22 and 5 : 16, being each equal to 31 per cent.

If we exclude the latter series in which only collateral relations exhibited nervous derangement, we find that there were still 16 per cent. in whom the disease might be fairly considered as hereditary. To my own mind, however, the evidence of hereditary or of family taint is as evident in the seeond series as in the first; and I am, therefore, led to believe that an hereditary tendency to epilepsy is much more common than it is generally represented to be by recent writers upon the subject.

Esquirol stated that epilepsy was more frequently transmitted on the fathers' than on the mothers' side;* but, so far as my own eases show, the reverse of this proposition is much nearer to the truth.

With regard to *sex*, it is a eommon belief that epilepsy is more frequent among females than males. Thus, Herpin says

* Des Maladies Mentales, Tome I., p. 406.

the proportion is as 37 : 31, or as 6 : 5 ;* and Delasiauve states that, in 1820, there were in the Salpêtrière 321 female epileptics; in Bicêtre, 160 male epileptics; whereas, in 1854, there were in the same institutions respectively 400 females, and 200 males.† Celsus, however, states, "id genus sæpius viros quam fœminas occupat."‡ So far as my own observation extends, I have found little difference between the sexes; and the difference I have observed has been that a larger number of epileptic males came under my care than of females; the proportions in eighty-eight cases being forty-nine of the former, and thirty-nine of the latter.

The *age* at which epilepsy makes its appearance in individuals has been studied carefully by many observers, and I would refer for information on this subject to the writings of Calmeil,§ Leuret,‖ Herpin,¶ Delasiauve,** Hasse,†† and Dr. Sieveking.‡‡

According to Dr. Sieveking, epilepsy makes its first attack in 69·23 per cent., from infancy to 20 years of age; in 15·38 per cent. from æt. 21 to 40; and in 15·38 per cent., from æt. 41 to 55.§§ Again, distinguishing between the two sexes, Dr. Sieveking has shown that in males but 28·57 per cent. are attacked before 10 years of age, while 37·50 per cent. of females suffer before that age; and that while so many as 42·85 per cent. of males are attacked between 11 and 20 years of age, there are only 29·16 per cent. of females whose epilepsy begins during that period. From this, therefore, it would appear that in the female sex epilepsy is developed earlier than in the male.

The results of my own observations upon this point may be represented in the following table :—

* Du Pronostic, &c., p. 332.
† Traité de l'Épilepsie, p. 195.
‡ Lib. III., cap. ii., § X.
§ Thèse sur l'Épilepsie, 1824.
‖ Archiv. gén. de Méd., 4me Scr., 1843, † ii.
¶ Du Pronostic, &c., p. 335.
** Traité de l'Épilepsie, p. 198.
†† Virchow's Handbuch, ant. cit., p. 264.
‡‡ Med. Chir. Trans., Vol. XL., p. 158.
§§ *Ibid.*, p. 158.

Age at commencement.	Males.		Females.		Total.	
Under 5 years	2	7	6	11	8	18
From 6 to 10 years	5		5		10	
„ 11 „ 12 „	3	22	1	18	4	40
„ 13 „ 15 „	11		8		19	
„ 16 „ 17 „	3		4		7	
„ 18 „ 20 „	7		7		14	
„ 21 „ 25 „	5	11	0	3	5	14
„ 26 „ 47 „	5		3		8	
„ 69 „ 70 „	1		0		1	
Unknown	3		2		5	
	45		36		81	

If we examine this table carefully, we find the following facts:—1. That regarding certain decennial periods, epilepsy begins much more frequently in that which extends from 6 to 17 years of age than in any other. There are 40 cases which commenced in that period; whereas there are not half so many in the first ten years of life, and there are not more than two-thirds of that number in the subsequent fifty years.

2. That regarding the proclivity to epilepsy during the first and the second quinquennial periods of life, viz. from birth to five years, and from six years to ten, we find but slight difference; there being eight in one division, and ten in the other.

3. That comparing the proclivity to epilepsy during the first and the second twelve years of life, there is a notable difference; twenty-two cases commencing under twelve years of age, and forty-five from thirteen to twenty-five years.

4. That the large number found in the second group is caused mainly by those whose epilepsy commenced during the five years that elapsed between thirteen and seventeen inclusive, there being, during that quinquennial period, no fewer than twenty-six cases; and of these the disease commenced in so large a proportion as nineteen, between the ages of thirteen and seventeen years.

5. That in regard of proclivity to epilepsy during the first ten years of life, the female sex exhibits the greater; that from six to twenty years of age there is little difference between the sexes; but that after twenty-one years of age there are nearly four times as many males as females attacked by the disease.

The general inferences from these facts are:—A. That the development, or at all events the period of first arriving at puberty, is, in regard of age, the most powerful predisposing condition to epilepsy. B. That the arrival at the "climacteric period" in women, is not demonstrably a predisposition to the disease. C. That there is nothing in the sexual organization of individuals which, from ten to twenty years of age, renders one or the other sex more prone to epilepsy; but D. That there is some sexual character which renders females under ten years of age more subject than males to epilepsy; and that there is something which renders males after twenty years of age more likely than females to become epileptic.

It is interesting to notice the first occurrence of epilepsy in a man nearly seventy years of age. This is so rare that it has been regarded as noteworthy by distinguished authors. For example, Heberden says, "unum vidi qui in eum incidit anno septuagesimo quinto;"* and Tissot, speaking of Morgagni's case, in which epilepsy began at sixty-eight years of age, says that it is "la seule de cette espèce que je me rappelle d'avoir lu; je n'avois vu jusqu'ici qu'un seule personne qui en eut été attaquée au-dessus de l'âge de soixante."†

The patient to whom reference is made above, came under my own care when nearly seventy-five years of age, having then been subject to attacks of epilepsy for more than four years. The first seizure occurred during the night, without assignable cause and without previous warning; and the attacks had recurred once in three or four weeks until the time I saw him. The patient was then a remarkably healthy-looking man, of active habits, firm nutrition, florid colour, good appetite, and regular digestion, with good sight and hearing. His pulse, 80 in the minute, was full and firm; his hands and feet were warm; and he was in every respect in apparent health.

* Commentarii de Morb. Hist., p. 126.

† Traité de l'Épilepsie, p. 220.

His memory had failed very slightly for little passing events of the day; but for a man of his age there was nothing in this respect that could be regarded as abnormal.

In the attacks he utters a cry; becomes dark round the mouth; his limbs pass through tonic and clonic spasms; he bites his tongue; froths at the mouth, and subsequently passes into stupor, in which there is stertor. From this sleep he arouses, after a variable time; and, but for the bitten tongue and a general soreness of the limbs, would not know that anything had happened.

During fourteen months he had eighteen of these attacks; and, at the end of that time, presented neither paralysis, nor modification of sensibility, or intelligence; nor, in fact, any symptom which would lead to a belief in the existence of organic cerebral disease, or of anything more than simple epilepsy.

There appears, therefore, to be no period of life the arrival at which exempts a man from the possibility of becoming epileptic; but the probability of his being so afflicted is less in each decennial period after twenty years of age. This is shown well in the following table of Hasse's:*—

Age at commencement.	Number attacked.
Congenital	87
Under 1 year of age	25
From 2 to 10	281
,, 10 ,, 20	364
,, 20 ,, 30	111
,, 30 ,, 40	59
,, 40 ,, 50	51
,, 50 ,, 60	13
,, 60 ,, 70	4
	995

It is interesting to know whether the age at which epilepsy shows itself is affected by the presence of hereditary taint.

* Virchow's Handbuch, 1st^e^ Abth., Band IV., p. 264.

Romberg has stated that the outbreak of hereditary epilepsy generally takes place before puberty;* and this, as a general proposition, agrees with my own experience.

The actual ages at which the attacks commenced in those twelve cases, in whom I could trace an hereditary taint, were as follows :—

Age at commencement.		Number of	Number of		
Males.	Females.	Males.	Females.		Total.
0	2	0	1	Under 5 ...	1
6	0	1	0		
0	10	0	1	6—10 ...	2
0	13	0	1		
0	14	0	1		
15	0	5	0	11—15 ...	7
18	0	1	0		
0	19	0	1	16—20 ...	2
		7	5		12

From this it is apparent that, whereas in the male sex hereditary epilepsy appears especially prone to commence at puberty,—six out of seven cases occurring between fifteen and eighteen years of age,—in the female sex there does not appear to be the same proclivity. What is more important, however, is the fact that in no one case was the outbreak delayed beyond the nineteenth year; and that in only two of twelve cases was it postponed until after the fifteenth.

The mean age at which hereditary epilepsy made its appearance was, for the male sex, fourteen years; and for the female sex, eleven : or, excluding the two extreme cases in each series, we have for the male sex a mean age of fifteen, and for the female twelve.

The mean ages at which positively non-hereditary epilepsy was developed in fifteen males, and eleven females, were respectively sixteen years for the former, and thirteen for the latter: showing that, as a rule, hereditary epilepsy is developed two years earlier than non-hereditary. On excluding extreme cases from the latter series, we have a mean age of eighteen for

* Manual of Nervous Diseases, Vol. I., p. 208.

the male sex, and fourteen for the female, exhibiting an increase of difference between the times at which hereditary and non-hereditary epilepsy appears.

The relation of this condition to the age at which disease begins will be, however, seen more accurately in the following table; in which thirty-eight cases are divided into hereditary and non-hereditary, and the ages at which the affection commenced are stated, with the number in each sex who were attacked at those ages :—

Age at commencement.	Hereditary.				Non-hereditary.			
	Males.	Females.	Total.		Males.	Females.	Total.	
Under æt. 2 ...	0	1	1		1	1	2	
,, æt. 6 ...	1	0	1	10	0	1	1	12
,, æt. 10 ...	0	1	1		2	1	3	
From 13 to 15 ...	5	2	7		3	3	6	
,, 16 ,, 19 ...	1	1	2	2	4	3	7	14
Above 20 ...	0	0	0		5	2	7	
	7	5	12		15	11	26	

This table shows that whereas of twelve hereditary cases, ten occurred under fifteen years of age, and only two above that age; of twenty-six non-hereditary cases twelve commenced under fifteen years of age, and fourteen above. Or, represented by per-centage :—

Age.	Hereditary.	Non-hereditary.
Under æt. 15 ...	83·33 per cent. ...	46·15 per cent.
Above æt. 15 ...	16·66 per cent. ...	53·82 per cent.
	99·99	99·97

From which it appears that, while hereditary epilepsy more commonly commences before fifteen than after that age, the reverse is true with regard to the non-hereditary disease.

A more striking fact is that, while not one of the hereditary cases commenced after twenty years, no less than seven of twenty-six, or 26 per cent. of the non-hereditary were attacked when beyond that age.

Another fact to be noticed is, that all of the six cases which were directly derived from stock exhibiting epilepsy, were themselves attacked by the disease before arriving at fifteen years of age; whereas in those six which presented evidence of taint in collateral relations only, there were two aged eighteen and nineteen respectively, the remaining four being seized when less than fifteen years of age.

B. Accidental causes, or conditions of disturbance.

It is often very difficult to estimate correctly the importance of certain conditions which patients, or their friends, may have regarded as the cause of a disease. This is especially so in the case of epilepsy, because there is a vigorous effort made by many to find out a cause, which shall be an adequate excuse to their own minds for the disease having occurred.

In many cases, however, no such discovery can be made; and in Dr. Sieveking's experience a definite cause was assigned by only one-third of his patients.* My own observations have furnished a larger proportion; rather more than one-half of my cases having referred their attacks to certain conditions which they considered to be causative.

Of sixty-nine cases examined by myself, I obtained definite answers in fifty-six: the remaining thirteen were unable, and their friends were likewise unable, to say whether or no the commencement of the attacks was referrible to any known or supposed cause. But seventeen,—whose condition, at the time when epilepsy made its outbreak, was known and carefully inquired into by myself,—gave me confident answers in the negative; asserting that it was impossible for either themselves or their friends to account in any way for the occurrence. Thirty-nine, on the other hand, referred their attacks to particular, and as they supposed causative, conditions.

The causes assigned by these thirty-nine individuals I have divided into four categories; placing in the *first*, those which operated psychically; such as mental and emotional disturbance: in the *second*, those which acted through the motorial, or reflective centre; such as eccentric irritations: in the *third*, those which produced their effects through the general,

* Medico-Chirurgical Transactions, Vol. XL., p. 159.

vegetal, or organic system; such as pregnancy, fever, &c.: and in the *fourth*, those which might be regarded as acting physically; such as insolation, and mechanical injury. The relative frequency of these causes may be represented in the following table:—

Nature of Cause.	Number of Males.	Number of Females.	Total.	Per cent.
I. Psychical :—				
Mental work	3	0	3	
Emotional disturbance	3	11	14	
Mental and emotional disturbance	2	1	3	
	— 8	—12	—20	28·98
II. Eccentric irritation :—				
Dentition	1	1	2	
Indigesta	5	0	5	
Venereal excitement	2	0	2	
	— 8	— 1	— 9	13·04
III. General organic changes :—				
Fatigue from exertion	1	0	1	
Commencement of menstruation	0	1	1	
Fright of mother during pregnancy	0	1	1	
Rheumatic fever	0	1	1	
Convalescence from pneumonia ...	0	1	1	
Pregnancy	0	1	1	
Arrest of lactation	0	1	1	
	— 1	— 6	— 7	10·14
IV. Physical influences :—				
Blow on the head	2	0	2	
Insolation	1	0	1	
	— 3	— 0	— 3	4·34
V. No assignable cause	10	7	17	24·63
VI. Doubtful	6	7	13	18·84
	36	33	*69	99·97

* It is somewhat interesting to compare this table with that of MM. Bouchet and Cazauvieilh. In nearly the same number of patients, there were 31 under the first head, 8 in the second, 3 in the third, 2 in the fourth, 26 in the fifth and sixth. There are 70 cases quoted in the work referred to. (De l'Épilepsie considérée dans ses Rapports avec l'Aliénation mentale, p. 76.)

From this table it appears that conditions acting psychically are much more commonly found occupying a causative relation to epilepsy than are any other. Next in frequency are the eccentric irritations; and, differing little from them in number, general organic disturbances; while physically operating causes are of comparatively rare occurrence.

In a large number "emotional disturbance" was apparently the occasion of an outbreak of epilepsy. This is quite in accordance with general testimony upon the question. Anger, terror, overwhelming sorrow, and exuberant joy have alike been followed by epileptic seizures. Morgagni relates the case of a nobleman in whom anger was the first occasion of an attack, and in whom the fits were reproduced by seeing the obnoxious individual.* Maissonneuve relates nineteen cases in which "fright" was the assigned cause;† and Dr. West speaks of it as a cause of epilepsy in children.‡ Among my own cases terror has been the occasion of epileptic seizures; but more frequently they have followed continued anxiety, and prolonged rather than intense alarm.

It is curious to observe that the fits—although sometimes occurring immediately as the consequence of fright—are, at other times, delayed for some hours, or even days. This has been the case in several of those individuals who have come under my own notice; and it is also remarkable in the records of others. In twelve of M. Maissonneuve's cases, the attacks occurred at the moment of alarm, or directly afterwards; whereas in seven there were intervals of twenty-four hours, four days, a fortnight, and even of a month.§

The female sex appears much more prone to these results of terror than the male: emotional disturbance was assigned as the cause of their attacks in so many as 36 per cent.; whereas in the male sex there were only 13 per cent. who referred their disease to that cause. On the other hand, mental work was found influential only in the male sex, and that in comparatively small proportion.

* De Sed. et Caus., Epist. IX., 5. Cooke's Morgagni, Vol. I., p. 108.

† Recherches et Observations sur l'Épilepsie.

‡ Lectures on Diseases of Infancy and Childhood, p. 132.

§ Recherches et Observations, ant. cit.

The age at which mental and emotional disturbances were found to operate thus injuriously is worthy of notice. The three males who assigned "mental work" as the cause of their attacks were aged fourteen, fifteen, and fifteen; giving as a mean age fourteen and two-thirds years. Those in whom emotional disturbance was the cause were aged eighteen, nineteen, and thirty; giving as a mean twenty-three and one-third years: and those in whom mental and emotional disturbance co-operated were nineteen and twenty-seven years respectively; giving the mean of twenty-three years. The one female who referred her epilepsy to mental and emotional causes combined was six years of age; while those in whom emotion alone operated varied in age from thirteen to nineteen years, with a mean of fifteen and nine-elevenths years. These numbers show, therefore, distinctly that in the female sex emotion tells more injuriously during growth than in after life; whereas such is not the case in regard of the male sex.

These relations will be more readily perceived by the following representation :—

Assigned Cause.	Mean age of Males.	Mean age of Females.
Mental work	$14\frac{2}{3}$	...
Emotional disturbance	$23\frac{1}{3}$	$15\frac{8}{11}$
Mental and emotional disturbance	23	6

Eccentric irritations were stated to have been the cause of attacks in many more males than females. In some of the cases represented in the foregoing table there were combinations of causative conditions, such as indigesta and tickling soles of the feet; indigesta, and catamenial disturbances, &c.: but in each case I have selected that cause which, upon careful consideration, appeared to me the more probable, and the more effective.

Of course in the above category I do not include numerous cases of "convulsions" arising from eccentric irritation, but which from their general character and course were, in my opinion, examples of "convulsion" only. Tho nine cases placed in the list were illustrations of confirmed epilepsy; the attacks having been first occasioned, and subsequently repro-

duced, by eccentric irritation; or, such having been the case at one period of their history, the attacks at a later period occurred without any demonstrable eccentric irritation.

Dentition as a cause of "convulsion" is, as every one knows, of very frequent occurrence; but as a cause of epilepsy it is rare, and I have observed it in but two cases. The attacks may commence at the first or the second dentition; or, as I have observed, in two cases, during the cutting of the "wisdom-teeth." One of the latter was an instance of genuine epilepsy; the other was somewhat doubtful in its character, and is not included in any of the foregoing tables.

Dr. Bright, some years ago, pointed out the period of the second dentition as frequently accompanied by epileptiform convulsion. I have seen several cases of convulsion attending this process, but, as already said, only two instances of decided epilepsy.

Remarks similar to the above apply to the relation between indigesta and epilepsy. But further, although an individual who is already epileptic may often reproduce his attacks by an indigestible meal, a distinct tracing of true epilepsy at its commencement to this cause is, so far as my own observation extends, rare. Such relation I have been able to discover in five cases only, and in some of these there were other causes operating at the same time; such as emotional disturbance, tickling the soles of feet, &c.

The reference of epilepsy to tickling of the soles of the feet is of considerable interest, and the case in which this occurred is given in detail.* Van Swieten relates a similar case:—"I have seen a very healthy girl of ten years of age, born of sound parents, who never had the epilepsy, rendered epileptic for several years, and the first time she was seized was upon having her soles tickled by some girls who were at play with her, some of them holding her fast upon the floor to prevent her avoiding that intolerable sensation."† Esquirol, as I have already stated (p. 52), mentions an instance of the same kind.‡

The two cases in which sexual excitement was referred to as

* See Case I., p. 47.

† Commentaries upon the Aphorisms of Boerhaave, sect. 1074.

‡ Des Maladies Mentales, Tome I., p. 300.

the cause of epilepsy were the only cases of genuine epilepsy which I have been able to trace to this circumstance. I have seen in many individuals convulsive phenomena, and other symptoms of somewhat hysteric character, apparently resulting from venereal excesses;—I have suspected extravagant venery or masturbation in some cases where I have not been able to establish their existence;—I have known several epileptics who, subsequent to the development of their disease, became extremely libidinous; but a demonstrable causative relation between the two elements, is, in my experience, extremely rare. On the other hand, I have known epileptics in whom the sexual feeling has become extinct; and this without any previous excess in its gratification.

Every one knows how frequently onanism and venereal excesses are suspected of epileptics, and how common is the belief in their causative relation to that disease. The belief and the suspicion have, in my opinion, arisen from the knowledge of a few glaring instances, and from the ignorance and absence of any other assignable cause in many cases. Many have known or heard of cases like that related by Zimmermann, of a young man who after every act of masturbation was attacked by epilepsy; or like that of Sauvages, or Dubreuil,* where the fits always occurred after every coition;† and when an instance of this kind has happened to fall under personal observation, the impression it produces on the mind is such that its real relation to the general mass of cases is mistaken. The particular cause assumes too great importance, and is often believed to act more widely than there is any evidence to warrant. I have often heard a suspicion of this kind of vice, uttered without the least ground for its existence—uttered for the reasons I have mentioned,—and with the effect of putting a stop to further investigation of the case.

Admitting that there is to be discovered sometimes the co-existence of excessive sexual activity and epilepsy, we must further remember the remark of Herpin,—"Quand un vice est aussi répandu, la relation de cause à effet est difficile à constater;"‡ and we must not too hastily assume their relation to

* De l'Épilepsie en général, p. 81.

† Esquirol, Des Maladies Mentales, p. 300.

‡ Du Pronostic et Traitement, p. 345.

be that of cause and effect. One of the cases which is mentioned in my own list was an example of masturbation, the other of excessive coition.

In the third category of causes, "general organic changes," there is to be found only one case from the male sex, and six from the female.

There is little comment needed upon the several conditions which compose this series. Dr. Radcliffe mentions "undue muscular exercise" as "one of the most frequent causes of individual attacks;"* and Tissot enumerates among the causes of epilepsy long, or violent exercise.† I have sometimes known, as Dr. Radcliffe says, the particular attacks brought on by fatigue, but only in one instance was the commencement of the affection set down to this cause.

In the case which was referred to "convalescence from pneumonia," the patient took enormous quantities of stimulus. In the case of "pregnancy," there was no albuminuria, nor œdema; nor, in fact, any sign of morbus Brightii.

With regard to these cases generally, it must be observed that in some of them there was, in addition to the cause described, the presence of hereditary taint. Thus of the seventeen instances without other assignable cause, hereditary predisposition was present in only one; so that the other eleven cases of hereditary taint are distributed among the remaining groups.

The age at which mental causes operate has already been alluded to; there appears to be nothing special in the proclivity of any age to be affected through the other categories. Among the second and third there was great variety; in the fourth the patients were under twenty.

III. Relations between Symptoms.

The relations to be examined are the following:—1. Those between the different forms of attack; their relative frequency, and bearing upon etiologic and other conditions. 2. Those of the mental condition of epileptics. 3. Those of the phenomena

* Epilepsy and other Convulsive Affections, p. 141.

† Traité de l'Épilepsie, p. 157.

representing changes in motility. And 4. Those of the alterations to be noticed in the general health.

A. Natural history of the different forms of attack.

The several varieties of epileptic seizure having been already described, we have now to discover the relations which these varieties bear to one another; their relation to time; and to certain etiologic conditions.

In considering the questions which arise with regard to the attacks, I shall omit those doubtful cases in which epilepsia gravior was unattended by loss of consciousness; and I shall group together the two forms or degrees of epilepsia mitior; and shall treat, therefore, of the two broadly separated groups of seizure commonly known as "le haut mal" and "le petit mal." In the former there is the complete epileptic attack; in the latter, the imperfect seizure.

1. *What is the relative frequency of "le haut" and "le petit mal?"*—Fifty-four cases—twenty-nine males, and twenty-five females—exhibited the following relations:—

	Males.		Females.	
Forms of Attack.	Absolute number.	Per cent.	Absolute number.	Per cent.
Epilepsia gravior only ...	14	48·27	11	44·00
Epilepsia mitior only ...	2	6·89	1	4·00
Two forms combined ...	13	44·82	13	52·00
	29	99·98	25	100·00

From this it appears that the severer form of attack is by far the more frequent, in both sexes; for it occurs in twenty-seven of twenty-nine males, and in twenty-four of twenty-five females: whereas the milder form was present in but fifteen males, and fourteen females. Epilepsia gravior is, therefore, nearly twice as common as epilepsia mitior.

Again, it is much more common for the severe attacks to exist without the slighter forms, than it is for the milder form to be present without the severe: the numbers being as 14 : 2 for the male sex; and as 11 : 1 for the female.

Further, it is extremely rare for the attacks of epilepsia mitior to occur alone. As yet I have met with this but in four cases:

and although I am not certain that, in some cases of distinct epilepsy, not included in this analysis, there were no attacks of "le petit mal," I am confident that no single case beyond the four that I have mentioned has come under my observation in which the slighter attacks were the only phenomena of the disease. Out of eighty-one cases, therefore, I have found but three in which "le petit mal" existed alone.

There is no important difference to be observed in regard of sex, in relation to the two forms of attack. The slight difference which is recorded is to the effect, that the female sex is more prone to "le petit mal" than is the male sex.

In answer to the first question, therefore, we may state:— *That epilepsia gravior is nearly twice as frequent as epilepsia mitior; and that for the latter to exist alone is an excessively rare occurrence.*

Upon this point, however, somewhat conflicting statements have been made by different authors. For example, Portal says that "presque tous ces malades éprouvent des éblouissements et des vertiges."* Foville also states, "le plus ordinairement ces deux formes de l'épilepsie se développent irrégulièrement chez les mêmes malades; mais il n'est pas rare de ne voir que la première (le haut mal) d'entre elles. It est moins commun, mais cela se rencontre néanmoins que la seconde (le petit mal) constitue à elle seule toute la maladie."† M. Delasiauve, however, differs from these authorities, stating that, "dans la section des épileptiques hommes, par exemple, 27 invidus seulement, sur 136, verraient se mêler aux grandes attaques de petits accès ou vertiges plus ou moins repétés. La coexistence des divers dégrés se montrerait plus fréquemment chez les enfants, puisqu'elle aurait eu lieu dans 18 cas sur 38."‡

It appears, therefore, that while in M. Delasiauve's cases "le petit mal" occurred in little more than one-fourth, in my own cases it was present in rather more than the half. It is possible, however, that this difference may be partly explained by the exclusion from my own series of all cases of simply epileptoid

* Observations sur la Nature et le Traitement de l'Épilepsie, p. 126.

† Dict. de Méd. et de Chir., art. "Épilepsie," p. 413.

‡ Traité de l'Épilepsie, p. 88.

disease, and of convulsions depending upon organic diseases of the brain.

Such, then, being the relation in regard of prevalence of the two forms of the attack, we have to inquire :—

2. *What is the influence of hereditary predisposition upon the form of attack?*

It has been shown already (page 124), that in the cases now under examination an hereditary or family proclivity to this disease, or to nervous derangement, was discoverable in 31 per cent. This number may be regarded as representing the frequency of hereditary taint as an element in the production of "le haut mal;" for there were but three cases in which this severer form of disease did not exist: and in only one of these three was there any indication of family predisposition, and in that one it existed merely in collateral relations. We have, therefore, to examine whether an hereditary taint affects the frequency of "le petit mal." The facts may be represented in the following table :—

Hereditary Taint.	Both sexes.	With epilepsia mitior.		Without epilepsia mitior.		Both sexes.	
		Males.	Females.	Males.	Females.	With.	Without.
Positively absent in	19	7	4	4	4	11	8
Positively present in	9	2	1	4	2	3	6
	28	9	5	8	6	14	14

It appears, from this table, that when hereditary taint is present, there are of those who are without "le petit mal," twice as many as there are of those who exhibit that symptom: while, on the contrary, when hereditary predisposition is absent, there are without epilepsia mitior fewer than there are with that phenomenon.

Again, there are equal numbers (14) with and without epilepsia mitior; but while of the fourteen who exhibited that symptom hereditary taint was present in only three, of the fourteen who did not there were six in whom the predisposition was discoverable.

It is, therefore, evident that an hereditary taint does not predispose to attacks of "le petit mal;" but that, on the contrary, its existence appears exclusive rather than productive of that phenomenon.

An inference which will very probably be drawn upon this question, is that the hereditary taint is such as to develop speedily the worst form of the disease; and that, therefore, when it is present, "le haut," rather than "le petit mal," will be produced: but, in order to prevent such conjecture from leading the reader astray, it may be stated now that "le petit mal" does not take the place of the severer seizures; but that it is an additional phenomenon, present in those cases where the frequency of epilepsia gravior is at its highest.* The presence, therefore, of "le petit mal" is, *cæteris paribus*, a sign of greater severity of disease than its absence; but it is the absence of this sign of severity which is associated with hereditary predisposition.†

With regard to the difference of sex, this only is worthy of observation,—that, whereas in the male sex the absence of hereditary taint appears a predisposition to epilepsia mitior, such is not the case in the female sex; the numbers, in regard of the latter sex, being equal. Where hereditary taint is present, the tendency to escape attacks of "le petit mal" is equal for the two sexes; being for each as 2 : 1. The numbers, however, are too small to establish any positive proposition in respect of sexual relationships; they are, however, quite sufficiently large to show the general relation of hereditary taint, and "le petit mal." For taking the whole number, 28, we find 9 in whom hereditary predisposition existed; this being equal to 32 per cent., and almost identical with the number found already (page 124), in the general estimate of that causative condition; whereas, of equal numbers, 14, with and without epilepsia mitior, the hereditary taint varies from 21 per cent. in the former series, to 42 per cent. in the latter.

We may conclude, therefore, *that hereditary taint is not without influence upon the character of the attacks; but that the influence*

* See p. 154.

† By comparing the remarks upon hereditary taint in relation to the *mental* state of the patient, with those in respect of the influence exerted by "le petit mal" upon the same state, further evidence will be obtained that epilepsia mitior is of the greatest importance in regard of the effects of the disease; and this being, as I think, placed beyond doubt, it is of very curious interest to know that hereditary predisposition prevents the individual from suffering the worst effects of his malady, rather than predisposes him to their development.

it exerts is favourable to the development of epilepsia gravior rather than of epilepsia mitior.

The next question which we have to consider is in regard of the influence which may be exerted upon the character of the epileptic paroxysms by the age at which the disease first makes its appearance. It may be asked, 3. *Is the form of attack determined by the age of the patient? or, if not so determined, is it influenced by age, and to what degree?*

The relationship of age, to epilepsy generally, has been considered in the sub-section Etiology, at page 126; so that it is now necessary to examine the subject with especial reference to epilepsia mitior. In the following table, therefore, the cases are divided into three series:—in the *first*, there are those who presented only attacks of epilepsia gravior; in the *second*, there are those cases which were complicated with epilepsia mitior; and in the *third*, there are the few in whom the latter form of paroxysm existed alone. The ages at commencement are divided into quinquennial periods; and the numbers placed in the lines of the several periods, represent, of course, the number of individuals in whom the disease commenced within those periods.

Age at commencement.	With epilepsia gravior only.			With epilepsia gravior and epilepsia mitior together.			With epilepsia mitior only.			With one or the other, or both.		
	Males	Females	Both	Males	Females	Both	Males	Females	Both	Males	Females	Both
Under 5 yrs.	1	3	4	1	2	3	0	1	1	2	6	8
6 to 10	0	2	2	2	2	4	0	0	0	2	4	6
11 to 15	6	0	6	3	5	8	1	0	1	10	5	15
16 to 20	1	5	6	4	3	7	1	0	1	6	8	14
21 to 25	1	0	1	2	0	2	0	0	0	3	0	3
26 to 30	1	0	1	0	0	0	0	0	0	1	0	1
31 to 35	1	0	1	0	0	0	0	0	0	1	0	1
36 to 40	0	1	1	1	0	1	0	0	0	1	1	2
Above 70	1	0	1	0	0	0	0	0	0	1	0	1
	12	11	23	13	12	25	2	1	3	27	24	51

The first obvious inference from the above table is, that age is not the sole determining cause of the form of paroxysm; for

both epilepsia mitior and epilepsia gravior have commenced at nearly all quinquennial periods up to the fortieth year. It is obvious further, that the influence exerted by age is comparatively trivial; for the cases in the first and second series are distributed upon the same general principle in each, and with no marked difference of detail.

There is, however, this to be observed, that whereas when the disease commenced under five years of age, half of the cases exhibited only the severer form of attack, and the other half exhibited either the milder form alone, or "le petit mal" in combination with "le haut mal;" when the disease began in the second quinquennial period, there were twice as many with epilepsia mitior as without it; when in the third, there were half as many again with "le petit mal" as with "le haut mal" only; when in the fourth, there were one-third as many again; when in the fifth, twice as many; but when commencing after twenty-five years of age, as in all the subsequent groups, there was only one-fourth of the number presenting "le petit mal."

We may conclude, therefore, that an early commencement does not predispose to one or the other form of attack; but that when the disease begins between the sixth and twentieth years, there is a stronger predisposition to the development of epilepsia mitior than there is at either an earlier or a later age: and also that when disease commences during that period, it is more likely to be displayed by both forms of attack than by one only.

A similar conclusion is warranted if, instead of representing the prevailing numbers commencing at particular ages, we compare the mean age at commencement of those cases where only epilepsia gravior was present, with that of the individuals in whom the two forms co-existed.

Forms of Attack.	Mean ages at commencement.		
	Males.	Females.	Both sexes.
Epilepsia gravior only	21·66	13·54	17·60
Epilepsia gravior and epilepsia mitior together	15·84	12·08	13·96
Epilepsia mitior only	16·00	2·00	14·66

The cases were so few in which epilepsia mitior existed alone, that although I have placed them in the above list, I attach no value to the numbers they furnish. For example, there was

only one female, so that the number 2 represents an accidentally early origin rather than a mean of ages at commencement.

In regard of the female sex there is so little difference between the mean ages at commencement, of those with and those without "le petit mal," that we must, for that sex, regard age as almost without influence upon the character of the attack. In the male sex, however, there is a difference of nearly six years; and as this difference is in the same direction as that observed in regard of the other sex, we must not consider it as accidental only; but must allow that the attacks of "le petit mal" are more commonly found in cases commencing early in life than in those which make their onset at a later period.

Again, we may estimate the mean age of patients at the time of observation, and then divide them into two series, by the presence or absence of "le petit mal." We find the following facts:—

Forms of Attack.	Mean age when observed.		
	Males.		Females.
Epilepsia gravior alone	27·08 yrs.	...	24·72 yrs.
Epilepsia gravior and epilepsia mitior together	25·38 yrs.	...	20·33 yrs.

From this, the same general relationship is apparent; viz. the association of epilepsia mitior with a lower mean age than that which is found in cases of epilepsia gravior only.

4. *What relation can be observed between the time during which epilepsy has existed, and the character of the attacks?*

Is epilepsia mitior associated with an early or a late period of the disease?

The duration of all the cases of epilepsy which came under my own care gave a mean of 8·72 years; and if we divide the cases, in the manner already described, into two series, we find the following facts:—

Forms of Attack	Mean duration of Epilepsy.		
	Males.		Females.
Epilepsia gravior only	5·41 yrs.	...	11·18 yrs.
Epilepsia gravior and epilepsia mitior together	10·07 yrs.	...	8·25 yrs.

The two sexes, in regard of this point, appear to present a remarkable difference. In the male sex, the cases with "le petit

mal" had had a longer mean duration than those without; whereas precisely the opposite relation existed in the female sex.

If, however, the mean of both sexes is taken, it is evident that in those cases where epilepsia mitior existed there had been a longer mean duration than in those where epilepsia gravior was the only paroxysmal phenomenon.

The influence of duration may, however, be shown more correctly by the following table, in which is given the prevailing duration of the disease, with and without "le petit mal:"—

Duration.	Number of cases with epilepsia mitior.			Number of cases without epilepsia mitior.			Number of cases with and without epilepsia mitior.
	Males.	Females.	Both.	Males.	Females.	Both.	
Under 5 yrs.	6	6	12	8	5	13	25
From 6 to 10	2	4	6	1	1	2	8
,, 11 ,, 15	2	1	3	2	2	4	7
,, 16 ,, 20	2	0	2	1	1	2	4
,, 21 ,, 25	0	1	1	0	1	1	2
,, 26 ,, 30	0	0	0	0	0	0	0
,, 31 ,, 35	1	0	1	0	0	0	1
	13	12	25	12	10	22	47

From this table it is quite evident that mere duration of the disease has nothing to do with the character of the attacks. For, under five years' duration, there are nearly the same number who have, and who have not "le petit mal;" and the numbers which occur afterwards indicate only a very trifling difference. Epilepsia mitior may, therefore, be present in the early period of a case's history; and, on the other hand, it may not appear in a case of epilepsy which has existed for five-and-twenty years. Further, I have known epilepsia mitior to exist by itself for many years without ever having been complicated by a grave attack: so that this form of paroxysm can be considered as neither the initial stage, nor the after-consequence of the severer form; but as an attendant phenomenon, appearing in some cases, but absent in others, and occurring at no particular period in the development of the disease.

5. *What is the relation of the two forms of epileptic paroxysm to time?*

In answering this question, we must distinguish between the absolute frequency of attacks and the period of their recurrence. One individual may have four attacks in one day, and then pass through four weeks of perfect freedom from seizures; another may have one attack, and then escape for a similar length of time. The "absolute frequency" in the former case is as one attack to seven days; the "period of recurrence" is four weeks. The "absolute frequency" in the latter case is as one attack to twenty-eight days, but the "period of recurrence" is the same as in the former case.

M. Herpin states,—"Les accès reviennent en suivant deux marches différentes; retour par accès isolés ou par paroxysmes. La première marche est trois fois plus fréquente que la dernière:"* but in my own experience, the paroxysmal, or serial combination of attacks, has appeared much less frequent.

Frequency of series of attacks of epilepsia gravior.—In the following table reference is made only to the paroxysms of epilepsia gravior. Ten of sixty-nine cases exhibited the serial form, and the attacks in these cases had the following character of recurrence:—

Period of recurrence.		Character of series.	Proportion of serial attacks.
		MALES.	
Interval of	seven days	... Four fits in one day.	3 of 36 cases.
,,	a month	... One fit daily for a week.	
,,	irregular	... Five fits in one day.	
		FEMALES.	
,,	one week	... Six or seven fits in one day.	7 of 33 cases.
,,	a fortnight	.. Two or three fits in the day.	
,,	,,	... One fit daily for several days.	
,,	,,	... Six or eight fits in one day.	
,,	three weeks	... Two or three fits in the night.	
,,	,,	.. Two to four daily, for a week.	
,,	four weeks	... Two in one day.	

* Du Pronostic et du Traitement curatif de l'Épilepsie, p. 376.

From this it appears that the serial form of recurrence was observed in little more than one-seventh of the cases, and that it was much more common in the female sex than in the male; being found in nearly one-fourth of the former, and in only one-twelfth of the latter.

Again, when the paroxysms assume a serial form, it is most common for the series to be completed within the day; this was observed in seven of the ten cases enumerated above.

Period of recurrence of both serial and isolated attacks of epilepsia gravior.—Upon this subject the observations of authors have furnished different results. M. Beau was of opinion, that a monthly frequency was the most common; Leuret, that a fortnightly period was the most numerously observed: M. Delasiauve gives the greatest frequency between two and six days;* while in M. Herpin's largest number, there were from one to six attacks in the week.†

The extreme irregularity of recurrence in many cases is the source of much difficulty in arriving at the truth upon this question. M. Delasiauve states, that in only three cases has he observed a distinct periodicity:‡ and my own experience is quite confirmatory of his remark, that regular periodicity is "exceptional" in epilepsy. Still it is possible to approximate the truth, and to give the average or prevailing period of recurrence in many cases.

Much, doubtless, of the belief in a monthly or fortnightly occurrence of epilepsy has been due to a credence in lunar influence; a credence not only of past, but of comparatively recent times, and one which I have encountered not unfrequently among the uneducated of this country at the present time. Dubuisson states, that when mania is complicated with epilepsy the attacks often reappear at the different phases of the moon.§

With regard to sixty-four of my own cases, I have obtained more or less satisfactory information as to the periods of recurrence, and the facts may be represented in the following tabular form:—

* Traité de l'Épilepsie, p. 83.
† Du Pronostic, &c., p. 366.
‡ *Ibid.*
§ Des Vesanies ou Maladies Mentales, p. 192.

Period of recurrence.	Number of Males.		Number of Females.		Both sexes.		Per-centage.
Under one day	6		5		11		
Three and a half days ...	0		1		1		
One week	3	12	2	17	5	29	45·31
Two weeks	3		9		12		
Three weeks	6		5		11		
One month...	6	12	5	10	11	22	34·37
Two months	3		3		6		
Three months	3		0		3		
Four months	1	9	0	4	1	13	20·31
Six months...	1		0		1		
Extreme irregularity ...	1		1		2		
	33		31		64		99·99

The two sexes being considered together, we observe, *first*, that there are more epilepties whose fits return after a comparatively short interval than after a long one. For example, recurrence under one month was noted in nearly 80 per cent., and over that period in only 20 per cent.: and again, while 45 per cent. had their attacks in less than fortnightly intervals, only 34 per cent. were found between the fortnight and the month. Half of the whole number of cases exhibited a recurrence at a period of less than three weeks.

The *second* important fact is, that there are definite epochs, or natural divisions of time, which occupy a prominent relation to the paroxysms. Thus, out of 64 cases, we find 45 occurring in nearly equal proportions, at the following times:—every day, fortnight, three weeks, and four weeks; and another 11, divided almost equally between the weekly recurrence, and that at two months. So that 56 of 64 cases, or 84 per cent., exhibited their attacks at intervals having definite relation to mundane conditions of time.

Of these particular times, therefore, there is but little difference in the influence of the day, fortnight, three weeks, and month: whereas each of these more than doubles that of the week: and since the number of patients who presented their

attacks at or near the period of a month was so large as 34 per cent., it is important to observe that 36 per cent. were males, and 31 per cent. females; so that if the recurrence at that particular time was due to genital conditions, the latter were of such nature as to affect the male sex more numerously than the female. It may be further stated, that in only three women could I detect any habitual relation between the attacks and the catamenial state. Although, therefore, ten women had their paroxysms at or about the period of a month, in seven of these there was no discoverable relation to the fact of menstruation.

The *third* fact of importance contained in the above table is that great frequency of seizure is more common in the female sex than in the male, and that, *vice versâ*, long intervals of absence are observed only in the latter. This is exhibited well in the following table:—

Number of both sexes.	Period of recurrence.	Males.		Females.	
		Absolute.	Per-centage.	Absolute.	Per-centage.
29	Under fortnight	12	41·37	17	58·62
22	At month ...	12	54·54	10	45·45
13	Over month ...	9	69·23	4	30·76

It appears, therefore, that although regular periodicity is rarely observed in epilepsy, and is entirely absent in some cases, yet that in the majority of cases there is an approximation to periodicity, and that the recurrence of attacks occupies a somewhat marked relation to the natural divisions of time; such as the day, the month, and fractional parts of the month. This relation, however, cannot be explained by the uterine changes which occur at the monthly period; but it must be referred to that which is common to the catamenial phenomena and the epileptic; viz. the influence of external physical conditions upon the animal organism.

Absolute frequency of attacks of epilepsia gravior.—In the following table, both serial and isolated seizures are included; and the mean frequency of attack in each individual is calculated in days, and fractional parts of days. In another column is given the number of attacks per annum; these numbers therefore so represent the *rate* of *frequency*, that

it may be taken as an index of the severity of the epileptic condition.

	Time of recurrence in days, and fractions of days.	Number of attacks per annum: or rate of frequency.	Number of Males.	Number of Females.	Number of both sexes.	Mean rate of groups.	
I. Under one day.	$\frac{1}{6}$	2190	0	1	1	5	1131
	$\frac{2}{6}$	1095	2	0	2		
	$\frac{3}{6}$	730	0	1	1		
	$\frac{4}{6}$	547	0	1	1		
II. From one to two days.	1	365	1	2	3	5	313
	$1\frac{1}{2}$	243	0	1	1		
	$1\frac{3}{5}$	228	1	0	1		
III. From two to four days.	2	182	1	1	2	4	153
	$2\frac{1}{5}$	130	1	0	1		
	3	121	0	1	1		
IV. From four to eight days.	4	91	1	0	1	6	69
	5	73	0	3	3		
	7	52	1	1	2		
V. From eight to sixteen days.	10	36	1	1	2	11	25
	$11\frac{1}{2}$	31	0	1	1		
	14	26	3	4	7		
	15	24	0	1	1		
VI. From sixteen to thirty-two days.	18	20	1	2	3	18	15
	21	17	4	2	6		
	25	15	1	0	1		
	30	12	5	3	8		
VII. From thirty-two to sixty-four days.	32	11	1	0	1	6	7
	42	8	0	3	3		
	60	6	2	0	2		
VIII. From sixty-four to one hundred and twenty-eight days.	80	$4\frac{1}{2}$	1	0	1	5	3·8
	90	4	3	0	3		
	120	3	1	0	1		
IX. Above one hundred and twenty-eight days.	180	2	1	0	1	1	2
			32	29	61		

It is important, I think, to reiterate that the foregoing table does not represent the actual periods at which the attacks recurred: it contains the estimated periods, arrived at by reducing to a common standard the numbers of attacks occurring in a given time. Thus, of two individuals, there may be one who suffered three attacks in one day; then passed three weeks in perfect freedom; and, at the end of that period, experienced again a series of three attacks; and such case would appear at the estimated period of seven days. There may be another who every month exhibited a series of six attacks; and such case would appear at the estimated period of five days. There may be a third in whom one attack occurred weekly; and such case would be placed at the period of seven days. The table, therefore, represents approximatively the measure of morbid tendency; exhibiting that in one individual it was sufficiently strong to produce, as an average, six attacks daily; that in another, it occasioned but one attack in six months; and that in others the severity of the disease ranged between these limits.

In the third column I have calculated the number of attacks per annum experienced by the different individuals; and this column, therefore, represents the rate of average frequency of attacks.

In the three succeeding columns are placed the numbers of males, of females, and of the two sexes together, which suffered their attacks at the several estimated periods; and exhibited the corresponding rates of frequency. The numbers in these columns, therefore, represent the degree of tendency which may exist to particular rates of frequency; so that for many of such rates we find but one individual; while for others there are six, seven, or eight. And again, they may be regarded as representing the tendency which epilepsy exhibits to affect individuals to different degrees of severity. These columns are condensed, in the adjoining line of figures; so that the numbers of individuals in different groups of frequency may be more readily compared.

In the last column I have given the mean rate of frequency, for all the individuals in each group respectively; so that, in the fourth group, for example, we see that there were six individuals who presented a mean frequency of sixty-nine attacks per

annum: in the sixth group, that there were eighteen who exhibited, as an average, fifteen attacks per annum.

The principle of grouping will be apparent at a glance; the advance is from the minimum number of days, to twice that number, as a maximum: for *e. g.* from two to four; from four to eight, &c.; and the rates of mean frequency for each group are, of course, related in an inverse order.

The general conclusions which we may form from the above tabular statement are the following:—

1. That the number of attacks in a given time ranges between very wide limits; for *e. g.* from two to two thousand per annum.

2. That extreme frequency and extreme rarity of attack are about equally uncommon. There were five cases in which the mean number of attacks per annum was upwards of eleven hundred; and there were five cases in which the mean number of seizures was less than four.

3. That the most commonly observed rates of frequency were fourteen and thirty days; and that nearly half of the whole number of cases were found between these limits. The prevalence of certain rates of frequency may be estimated by the following sub-table:—

Groups.	Rate of frequency.	Number of cases.	Per cent.	Mean number of attacks per annum.
I. and II.	From $\frac{1}{6}$ to 2 days.	10	16·39	722
III. and IV.	,, 2 ,, 8 days.	10	16·39	111
V. and VI.	,, 8 ,, 32 days.	29	47·54	20
VII. and VIII.	,, 32 ,, 128 days.	11	18·03	5

4. That the sexual differences which appear, in regard of frequency, are trifling, and to the following effect:—(*a*), that extreme frequency is more common in the female than the male sex; and (*b*), that extreme rarity is more common in the latter than the former.

Period of recurrence of attacks of epilepsia mitior.—If there is difficulty in ascertaining accurately the period of recurrence of "le haut mal," there is still greater in discovering that of the milder form; and for the very obvious reason that numerous attacks may occur without the patient's knowledge.

In twenty-five cases I have been able to ascertain the fre-

quency with some approximation to correctness; and they are distributed as follows:—

Frequency of epilepsia mitior.	Number of cases.
More than once in a day	3
From two to six days	9
About once a week	3
Every fortnight or three weeks	6
From a month, upwards	4
	25

From this it would appear that long intervals are rare, and that in more than half of the cases the attacks recurred after an interval of a week or less.

Effect of epilepsia mitior upon the frequency of epilepsia gravior.—It is, of course, important to know whether these two forms of attack are vicarious, the one of the other; or supplemental, the one to the other:—whether, when an individual has attacks of "le petit mal," he suffers the same number, a larger number, or fewer of "le haut mal," than he would if the latter existed alone.

Knowing, then, the frequency, or period of recurrence, of epilepsia gravior, let us see whether a high or a low rate of frequency is associated the more commonly with epilepsia mitior. We may do this by dividing forty-nine cases into two series: first those with, and secondly those without, "le petit mal;" and in regard of each series, we may furnish the number of cases presenting particular periods of recurrence of "le haut mal."

In the following table the lines, read horizontally, state the numbers of individuals of both sexes who, at ten different periods of recurrence of their severe attacks, presented, and did not present, epilepsia mitior. Thus, epilepsia gravior, for example, recurred in eleven individuals at the period of one month; six were males, and five were females: of the six males one only presented epilepsia mitior; of the five females, three exhibited that phenomenon.

Epilepsia gravior. Period of recurrence.	Males. Epilepsia mitior. Present.	Males. Epilepsia mitior. Absent.	Females. Epilepsia mitior. Present.	Females. Epilepsia mitior. Absent.	Both sexes. Epilepsia mitior. Present.	Both sexes. Epilepsia mitior. Absent.	Absent and Present.
Under one day, and one day	3	2	3	2	6	4	10
Three and a half days ...	0	0	0	1	0	1	1
One week	1	0	0	0	1	0	1
Two weeks	1	0	4	3	5	3	8
Three weeks	0	4	3	1	3	5	8
One month	1	5	3	2	4	7	11
Two months	1	1	0	2	1	3	4
Three months	2	1	0	0	2	1	3
Four months	1	0	0	0	1	0	1
Extreme irregularity ...	0	1	1	0	1	1	2
All periods	10	14	14	11	24	25	49

It appears from this table, that of the ten cases where attacks of epilepsia gravior were extremely frequent—viz. those recurring daily, and more frequently than daily,—the majority presented epilepsia mitior. A similar relation existed up to the period of fortnightly frequency; but when the time of recurrence was longer than a fortnight the relation altered, and the absence of "le petit mal" was recorded more numerously than its presence.

At high rates of frequency, therefore, epilepsia mitior is more common than at lower rates; so that it does not appear to take the place of epilepsia gravior, but is a phenomenon accompanying the disease when it exists to a severe rather than a mild degree.

Again, when epilepsia mitior is present, only half the cases suffered their attacks of epilepsia gravior at a period exceeding the fortnight; but when epilepsia mitior was absent, more than two-thirds of the cases exhibited the more lengthened intervals. The presence of "le petit mal," therefore, appears to augment the frequency of "le haut mal."

Represented by per-centage, we see the relations still more clearly.

Recurrence less than a fortnight, 60 per cent. with epilepsia mitior, and 40 per cent. without.

Recurrence longer than a month, 41 per cent. with epilepsia mitior, and 58 per cent. without.

When epilepsia mitior present, 50 per cent. recurred under 14 days, and 50 per cent. above 14 days.

When epilepsia mitior absent, 32 per cent. recurred under 14 days, and 68 per cent. above 14 days.

The only striking sexual difference to be recognised in the foregoing table is in regard of those cases in which the period of recurrence was either three weeks or a month. In the male sex, epilepsia mitior was at those periods more frequently absent than present; whereas, in the female sex, the reverse was true.

If we examine the relation occupied by epilepsia mitior to the absolute frequency of epilepsia gravior, as the latter was represented on page 150, we find the following facts:—

Group.	Estimated period of recurrence.	Mean rate of frequency per ann.	Present.	Absent.	Present and absent.
I.	Under 1 day ...	1131	2	0	2
II.	From 1 to 2 days	313	3	3	6
III.	From 2 to 4 days	153	1	2	3
IV.	From 4 to 8 days	69	3	4	7
V.	From 8 to 16 days	25	4	2	6
VI.	From 16 to 32 days	15	4	9	13
VII.	From 32 to 64 days	7	2	2	4
VIII.	From 64 to 128 days	3·8	2	3	5
			21	25	46

It appears from this table that "le petit mal" was present in both of the cases where more than one attack took place daily; and that it was as often present as absent when the rate of frequency was from one to two days. In the two next groups, as the frequency diminished the numbers presenting epilepsia mitior diminished; again it increased, diminished, became equal to, and less than the number in whom its absence was recorded.

If we combine the first four groups, and the last four groups, and compare their sums, we see that an equal number exhibited "le petit mal," and were free from that complication, where the

rato of frequency was high; but that when the rate of frequency was low, "le petit mal" was more commonly absent than present. Thus:—

Groups I. to IV. inclusive, contain 9 with, and 9 without epilepsia mitior.

„ V. to VIII. „ „ 12 „ 16 „ „

Broadly considered, therefore, there is the same relation between epilepsia mitior and the absolute frequency of epilepsia gravior, as there is between the former and the relative frequency of the latter; and, from both modes of considering that relation, we may infer that "le petit mal" is not vicarious of "le haut mal;" but that, on the contrary, it occurs most commonly in those severe cases where the attacks of epilepsia gravior are extremely numerous; and that it is more commonly absent than present in those milder cases where the intervals of attack are prolonged.

Further, the tendency to exhibit epilepsia mitior is associated with a short period of habitual recurrence, rather than with a high rate of absolute frequency; and *vice versâ*, those cases in which the period of return is much prolonged are the instances where epilepsia mitior is absent, rather than those cases where (the intervals varying considerably) the average rate of frequency is low.

If we may speak of the quality of the disease epilepsy to be in one set of cases that of rapid recurrence, and in another series that of great severity, marked by the absolute number of seizures; it is with those of the former series that "le petit mal" is especially associated.

6. *How is the relation to time, of epilepsia gravior, affected by the interparoxysmal condition?*

What effect upon the frequency of attack is exerted by the mental, motorial, and organic conditions respectively?

a. The mental state of the patient:—What is the relative frequency of attacks in the several mental classes? Are they more or less common when the mind is much impaired? A table furnished hereafter illustrates this relation fully; but its results may be now recognised if it be analysed thus.

Time of recurrence.	MENTAL GROUPS. 1st and 2nd.	3rd and 4th.	Total.
I. Under 1 day...	1	3	4
II. From 1 to (2 × 1) 2 days	2	4	6
III. From 2 to (2 × 2) 4 days	4	0	4
IV. From 4 to (2 × 4) 8 days	2	3	5
V. From 8 to (2 × 8) 16 days	9	0	9
VI. From 16 to (2 × 16) 32 days	10	7	17
VII. From 32 to (2 × 32) 64 days	4	0	4
VIII. From 64 to (2 × 64) 128 days	4	0	4
IX. Above 128 days	1	0	1
	37	17	54

From this table it is evident that great frequeney of attaek and mental deterioration are more frequently assoeiated than are opposite eonditions; but it is also apparent that this association is not essentially neeessary, and that neither is the only causative eondition of the other.

b. The eondition of the patient in regard of motility, in its relation to the frequency of attaeks.

Whether or no the number of seizures in a given time, or rather the rate of recurrenee of attaeks, is greater in those cases who present, during the interparoxysmal period, mueh or little disturbanee of motility, may be seen from the following table, in which is stated the number of eases in each motor elass who exhibited different rates of frequeney :—

Rate of recurrence.	1st class.	2nd class.	3rd class.	4th class.	Total.
I. Under one day	0	4	0	0	4
II. From 1 to (2 × 1) 2 days	0	3	1	0	4
III. From 2 to (2 × 2) 4 days	3	1	0	0	4
IV. From 4 to (2 × 4) 8 days	2	0	0	0	2
V. From 8 to (2 × 8) 16 days	1	4	4	0	9
VI. From 16 to (2 × 16) 32 days	5	6	5	1	17
VII. From 32 to (2 × 32) 64 days	1	2	1	0	4
VIII. From 64 to (2 × 64) 128 days	1	2	0	2	5
IX. Above 128 days	0	0	0	0	0
	13	22	11	3	49

Presenting this table in a more condensed form, we may the more readily appreciate its results:—

Rate of recurrence.	1st and 2nd classes.	3rd and 4th classes.	Total.
Groups I. and II. ...	7 ...	1 ...	8
,, III. and IV. ...	6 ...	0 ...	6
,, V. and VI. ...	16 ...	10 ...	26
,, VII. and VIII. ...	6 ...	3 ...	9

From this it is apparent that a high rate of frequency of attack is more commonly associated with slight degrees of motor disturbance; and that a low rate of frequency is relatively more usually associated with marked degrees of motile activity, than are the opposite conditions. In other words, those individuals whose attacks are very frequent do not commonly exhibit clonic spasm, tremor, and tonic spasm; while, on the contrary, those whose attacks are more rare do present these motor phenomena.

c. The relation between general, organic health and the frequency of attacks.

It is important to know whether those whose physical powers are deteriorated are more or less liable than the robust to the return of the epileptic paroxysm.

This information may be gained by comparing the relative frequency of attacks in those four classes of patients, which were formed in accordance with the state of their general health.

	CLASSES IN REGARD OF GENERAL HEALTH.				
Frequency.	First.	Second.	Third.	Fourth.	Total.
Under one day	4	0	0	0	4
From 1 to 3 days ...	6	2	0	0	8
,, 4 ,, 6 ,, ...	3	1	0	0	4
,, 7 ,, 10 ,, ...	1	2	0	0	3
,, 14 ,, 18 ,, ...	4	5	2	0	11
,, 21 ,, 25 ,, ...	4	2	1	0	7
,, 30 ,, 32 ,, ...	4	4	0	1	9
,, 42 ,, 60 ,, ...	2	2	1	0	5
At 80 days	0	0	1	0	1
,, 90 ,, ...	1	2	0	0	
,, 120 ,, ...	1	0	0	0	1
	30	20	5	1	56

Nothing can be more obvious than the inferences to be drawn from this table. Those individuals whose attacks were of very frequent recurrence exhibited positively no defect in their general health; whereas, on the contrary, those in whom the organic condition was much below par, presented only a low rate of recurrence.

A relation is maintained between the first and second classes, respectively, similar to that which obtains between the two first and the two last when these two are added together: so that the general rule holds good at each degree of physical deterioration.

It is evident, therefore, that a high rate of frequency of recurrence is not determined by organic ill-health; but that, on the contrary, a notable frequency of attack is associated with unimpaired general health.

7. *Influence exerted upon the frequency of attacks by age and duration of disease.*

The questions which are proposed for solution, in this section, are the following:—(*a.*) Are epileptic paroxysms more numerous—or, do they recur more frequently—in the young than in the old? (*b.*) Does the age at which epilepsy commences predispose, in either direction, in regard of frequency of seizure? (*c.*) Is frequency of attack, as a rule, an early or a late feature of the disease; or, in other words, what is the effect of duration of the malady upon the rate of recurrence of its attacks?

In order to answer these questions, I have divided the cases into nine groups; the principle of division being the frequency of recurrence of attacks; and against each individual in these groups, I have recorded the age when the disease commenced, the number of years that it had lasted, and the actual age at the time of observation.

Thus, among those whose attacks recurred "under one day," there were two males and three females. In one male the disease had lasted for seventeen years, having commenced at eight years of age, he being when under observation twenty-five; another had become epileptic at twenty-one, and had suffered from the disease for five years before I saw him.

Number of group, and time of recurrence.	MALES.			FEMALES.		
	Duration in years.	Age at commencement.	Age now.	Duration in years.	Age at commencement.	Age now.
I. Under one day ...	17	8	25	16	1	16
	5	21	26	8	15	23
	0	0	0	5	18	23
II. From 1 to (2 × 1) 2 days	3	11	14	5	20	25
	0	0	0	10	16	26
	0	0	0	2	15	17
III. From 2 to (2 × 2) 4 days	20	1	20	40	10	50
	14	1	15	13	1	14
IV. From 4 to (2 × 4) 8 days	7	30	37	4	16	20
	0	0	0	10	18	28
	0	0	0	1	17	18
V. From 8 to (2 × 8) 16 days	5	14	19	11	17	28
	7	14	21	2	10	12
	4	16	20	5	7	12
	1	14	15	10	6	16
	0	0	0	12	18	30
	0	0	0	4	14	18
	0	0	0	7	13	20
VI. From 16 to (2 × 16) 32 days	4	27	31	5	15	20
	4	71	75	10	13	23
	1	33	34	22	2	24
	31	12	43	5	7	11
	4	22	26	10	13	23
	7	14	21	4	20	24
	11	28	39	0	0	0
	1	15	16	0	0	0
	14	24	38	0	0	0
	6	17	23	0	0	0
	2	19	21	0	0	0
VII. From 32 to (2 × 32) 64 days	4	19	33	3	36	39
	1	19	20	1	19	20
	0	0	0	3	15	18
VIII. From 64 to (2 × 64) 128 days	7	19	26	0	0	0
	15	6	21	0	0	0
	1	15	16	0	0	0
	1	31	32	0	0	0
	2	25	27	0	0	0
IX. Above 128 days	8	18	26	0	0	0

From this table we may observe that extreme frequency of attack, such as existed in the first two groups, was commonly found in those individuals whose attacks had commenced before they had attained seventeen years; but, on the other hand, that early commencement does not necessarily entail a high rate of frequency.

We may also observe that very early commencement, such as that which takes place during the first twelve years of life, was very commonly associated with a low rate of frequency.

Further, it is evident that very great rapidity of recurrence may exist when the disease has had only a short duration; and, on the other hand, that, after the disease has existed for a considerable number of years, the rate of frequency may be very low.

With regard to the actual age, when under observation, it is evident that the influence is slight.

The results, however, to be obtained from this mode of regarding the question may be more readily perceived by calculating the means of the numbers in the several groups; and then further reducing the groups to three, and calculating the mean of each triplet of groups: thus, combining both sexes, *i. e.* male and female, together, we have the following table:—

Groups representing time of recurrence.	Mean age at commencement.	Mean duration of disease.	Mean age when observed.
I.	12·6 years	10·2 years	22·6 years
II.	15·5 ,,	5·0 ,,	20·5 ,,
III.	3·2 ,,	21·7 ,,	24·9 ,,
IV.	20·2 ,,	5·5 ,,	25·8 ,,
V.	13·0 ,,	6·1 ,,	19·1 ,,
VI.	20·7 ,,	8·2 ,,	28·9 ,,
VII.	21·6 ,,	2·4 ,,	24·0 ,,
VIII.	19·2 ,,	5·2 ,,	24·4 ,,
IX.	18·0 ,,	8·0 ,,	26·0 ,,

Although a law may be seen developing itself in the above, yet it is more plainly recognisable when the groups are reduced to three; for in that case we have the following:—

Groups representing time of recurrence.	Mean age at commencement.	Mean duration of disease.	Mean age when observed.
From 1 to 4 days ...	10·4 years	12·3 years	22·7 years
,, 4 ,, 32 ,, ...	17·9 ,,	6·6 ,,	24·5 ,,
,, 32 ,, 128 days and upwards	19·6 ,,	5·2 ,,	24·3 ,,

From this we may infer—1. That an early commencement of the disease is more commonly found associated with a high rate of frequency than is the reverse; and that as the onset of epilepsy is delayed, the probability of frequent attacks is diminished.

2. That as the disease continues, the tendency is for the attacks to increase, rather than to diminish, in frequency; and

3. That the actual age of the patient has little effect upon the rate of recurrence; but that what little effect is discoverable is to show that in early life the tendency to rapid recurrence is greater than at a more advanced period.

These results, it must be borne in mind, are but approximations towards the truth; they represent the general tendencies of the disease as exhibited in fifty-six individuals; but there is abundant evidence to prove that there are exceptions,—and somewhat numerous exceptions,—to so-called statistical laws.

8. *Relation between hereditary predisposition to epilepsy, and the frequency of attacks.*

That the presence of hereditary taint does not entail a high rate of frequency is evident from the fact, that of four males in whom such taint was present the times of recurrence were 30, 60, 90, and 90 days; and that of four females, similarly predisposed, the times were 10, 15, 14, and 42 days.

B. The Mental Condition of Epileptics in its several relations.

It has been shown already that epileptics may be divided into four classes, by a consideration of their mental state. (See page 41.) In the first class there is no discoverable sign of intellectual failure; in the remaining three there are progressive degrees of deterioration, the fourth class being the worst. The object of this section is to discover upon what conditions this mental weakness depends. The first question which occurs is—

1. *Can the presence or absence of intellectual failure be referred to the existence or non-existence of hereditary predisposition?*

In order to answer this question, I have represented in the following table of thirty-four cases the numbers which were found in each of the four mental classes respectively, and have

then subdivided each of these classes into hereditary and non-hereditary.

Number of class.	Twenty-one Males. Hereditary taint.		Thirteen Females. Hereditary taint.		Thirty-four Total. Hereditary taint.	
	Present.	Absent.	Present.	Absent.	Present.	Absent.
1.	4	8	3	2	7	10
2.	2	4	2	3	4	7
3.	0	2	0	0	0	2
4.	0	1	0	3	0	4
	6	15	5	8	11	23

From this table it is at once evident that hereditary taint is not essential to the production of mental failure; for in the six cases which exhibited the greatest degree of intellectual impairment no such predisposition existed. Again, when hereditary taint is present, it does not appear to predispose to mental decrepitude; for it was present in seven of seventeen individuals who were, so far as their intellect is concerned, free from any sign of decay. Of the thirty-four individuals above represented, hereditary taint was discoverable in 32 per cent., which is practically the number already given (at page 124); but in those who formed the first mental class, and were, therefore, intellectually sound, 41 per cent. exhibited an hereditary predisposition; in the second class, 36 per cent.; while in the third and fourth classes there was no hereditary tendency discoverable.

The numbers represented in the above table are too small to establish any doctrine with regard to the degrees of mental failure and their relation to hereditary taint; but they are amply sufficient to prove that there is no necessary dependence of the one upon the other. For if in the first class of mental condition there was but one epileptic who possessed an hereditary tendency to the disease, and if in the third and fourth classes there was but one in whom that tendency was absent, the non-essential nature of their mutual relation is established. *A fortiori*, therefore, with seven fulfilling the first condition, and six fulfilling the second, the proof is as strong as could be wished.

The answer, therefore, to the question asked at the commence-

ment of this subject, is in the negative, viz., *The presence or absence of intellectual failure cannot be referred to the existence or non-existence of hereditary predisposition.*

The next question to be considered is the following :—

2. *Can the mental condition of the epileptic be shown to depend upon the age at which the disease commenced?*

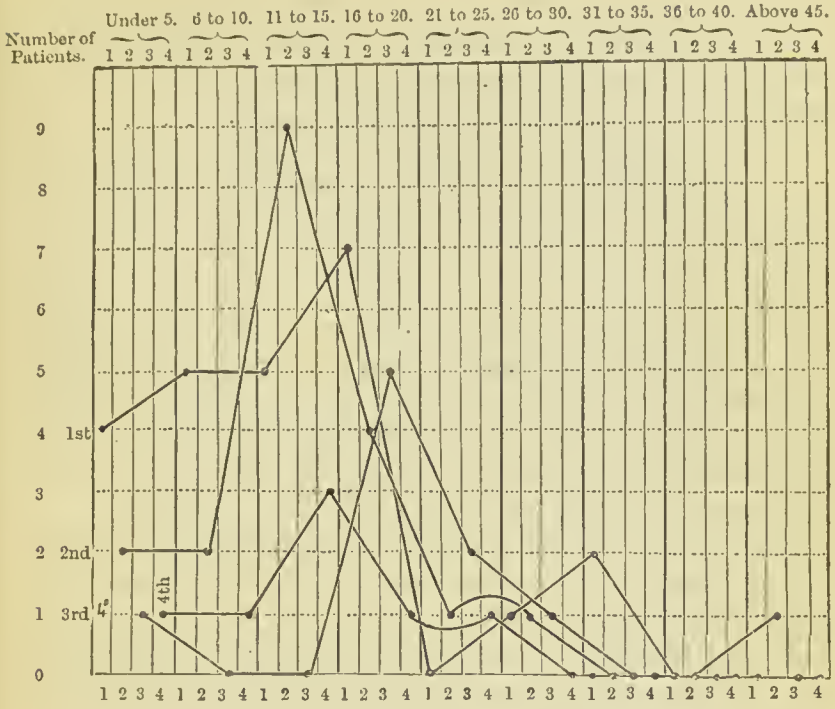
There are two modes in which the materials for answering this question may be represented. In the first, having divided the epilepties into four classes, we may give the number of individuals in whom epilepsy commenced at each quinquennial period of life; we may then divide at any point we choose, say twenty or fifteen years of age, and extract in the several classes the numbers in whom the disease commenced above and below those ages. A second method is to compare the mean age at which, in each of the classes, the disease made its appearance.

The first method is exemplified in the following table :—

Age at commencement.	First class.			Second class.		
	Males.	Females.	Total.	Males.	Females.	Total.
0 to 5 years ...	2	2	4	0	2	2
6 ,, 10 ,, ...	1	4	5	1	1	2
11 ,, 15 ,, ...	5	0	5	5	4	9
16 ,, 20 ,, ...	5	2	7	2	2	4
21 ,, 25 ,, ...	0	0	0	1	0	1
26 ,, 30 ,, ...	1	0	1	0	1	1
31 ,, 35 ,, ...	2	0	2	0	0	0
36 ,, 40 ,, ...	0	0	0	0	0	0
Above 45 ,, ...	0	0	0	1	0	1
All ages	16	8	24	10	10	20

Age at commencement.	Third class.			Fourth class.		
	Males.	Females.	Total.	Males.	Females.	Total.
0 to 5 years ...	0	1	1	0	1	1
6 ,, 10 ,, ...	0	0	0	1	0	1
11 ,, 15 ,, ...	0	0	0	0	3	3
16 ,, 20 ,, ...	1	4	5	0	1	1
21 ,, 25 ,, ...	2	0	2	1	0	1
26 ,, 30 ,, ...	1	0	1	0	0	0
31 ,, 35 ,, ...	0	0	0	0	0	0
36 ,, 40 ,, ...	0	0	0	0	0	0
Above 45 ,, ...	0	0	0	0	0	0
All ages	4	5	9	2	5	7

These relations may be represented pictorially in the following diagram:—



The facts which are apparent from the preceding table and diagram are of considerable interest. It is evident that in regard of each class there is this general law—that the number of patients whose epilepsy commenced at ages varying from eleven years to twenty was greater than of those in whom it commenced at any other age. This increased frequency of commencement, therefore, during that decennial period, is a property of epilepsy *per se*, and is not specially related to the presence or degree of mental failure.

There is no other general principle in which the four groups agree, except this very wide one, that the number of cases is less for each group at advanced than at early periods of life.

If the four classes are considered differentially in regard of age at commencement, we have the following facts:—

That early commencement is more common in the first group than in the second, and in the second than in the third and

fourth; and that late commencement is more frequent in the first and second than in the third and fourth.

If we divide the patients into two series, placing in the first those whose epilepsy began before, and in the second those in whom it commenced after, twenty years of age, we have the following numbers, when reduced to per-centage:—

	First class.		Second class.		Third class.		Fourth class.	
Age at commencement.	Actual number.	Per cent.	Actual number.	Per cent.	Actual number.	Per cent.	Actual number.	Per cent.
Under 20 yrs.	21	87·5	17	85·0	6	66·6	6	85·71
Above 20 ,,	3	12·5	3	15·0	3	33·3	1	14·28

With the exception, therefore, of the third class, in which the number in whom epilepsy commenced early in life is relatively much smaller than in the others, there is but little difference to be detected; all of the groups agreeing in this, that it is much more common for epilepsy to begin before than after twenty years of age.

It is apparent that the mind is not specially affected in those whose epilepsy begins early, neither is it in those whose disease is late in its development.

If we form another two series of the patients, dividing them at ten years of age, and combining the second, third, and fourth classes together, in order to contrast them with the first, we see that of 24 individuals forming the first class, 9, or 37·50 per cent., exhibited the disease when under ten years of age; but of those in whom the mind was more or less seriously damaged, only 7 of 36, or 19·44 per cent., were affected at that early period of life. An early commencement of epilepsy does not therefore entail, but seems rather to prevent, the mental failure which is often one of the concomitants of that disease.

Romberg has said, that "when epilepsy occurs at the earlier periods of life, and before puberty, it is generally followed by idiocy, and is frequently complicated with paralysis of single members."* The preceding statements show that, so far as my own observation has extended, such is not the case with regard to the earlier periods of life. As to the frequency of paralysis, I may say, that in simple epilepsy I have never met with paralysis except in three instances, and that in those it

* Manual of Nervous Diseases, Vol. II., p. 209.

was of simply accidental occurrence, and presented itself very early in the history of the case.

The interesting question here raised by Romberg, and previously by Esquirol,* is with regard to the influence of puberty upon the mental condition of epileptics. It has been already shown that a large number of cases date their origin during that transition period of the organism (see page 126); but it has also been shown that in but few cases can the attacks be referred, at their commencement, to sexual conditions. (See page 136.) Granting, therefore, that the general organic changes attendant upon puberty may be regarded as predisposing conditions to epileptic disease, and that there is yet wanting any evidence to prove that special derangements of the genital functions possess any notable causative influence; we return to this question—whether the commencement of epilepsy before or after puberty has any special effect upon the subsequent mental condition of the patient? Romberg states that it has, and that the effect is prejudicial; but the cases which have come under my own care would appear to warrant a different conclusion.

It being impossible to ascertain, in regard of time, the exact relationship of many cases to the development of puberty, I have divided the cases generally at the age of sixteen years, and have so placed, that they may be compared, the numbers of males and females in each mental class. I have chosen the age sixteen, it being generally understood that puberty is about fully established at that age in the majority.†

	First class.			Second class.		
Age at commencement.	Males.	Females.	Total.	Males.	Females.	Total.
Under 16 years ...	8	6	14	6	7	13
Above 16 years ...	8	2	10	4	3	7
	16	8	24	10	10	20

	Third class.			Fourth class.		
Age at commencement.	Males.	Females.	Total.	Males.	Females.	Total.
Under 16 years ...	0	1	1	0	4	4
Above 16 years ...	4	4	8	1	1	2
	4	5	9	1	5	6

* Des Maladies Mentales, Tome I., p. 288.

† Carpenter's Principles of Human Physiology, pp. 992 and 996.

From this table it is evident, 1. That commencement before puberty does not necessarily or prominently entail mental failure upon either sex; for out of twenty-four cases in which no intellectual impairment could be detected, no less than fourteen had suffered from the disease before they were sixteen years of age.

It appears, 2. That the commencement of epilepsy after the sixteenth year is completed does not prevent the occurrence of serious mental failure; for, out of fifteen cases exhibiting great defect of mind, no less than ten were free from the disease until after puberty.

We may conclude, 3. That the chances of mental impairment are precisely the reverse of those which Romberg has stated them to be; for, throwing together the first and second, and the third and fourth classes, we find that whereas of those in whom there was little or no intellectual deterioration, there were so many as 61 per cent. who suffered before reaching their sixteenth year; on the contrary, of those in whom there was considerable defect of mind, there were but 33 per cent. who dated their disease from so early a period of life. Early commencement of epilepsy, or commencement before puberty, is of favourable omen, therefore, in the prognosis of an individual's intellectual chances.

The second method by which we may reply to the question on page 164, is a calculation and comparison of the several mean ages at which epilepsy commenced in those individuals who formed the four classes respectively.

Mental class.	Mean age of Males.	Mean age of Females.	Mean age of two sexes.	Mean of two groups.
First	16·68	9·37	14·25	14·15
Second	14·58	13·33	14·05	
Third	22·50	14·00	17·77	15·67
Fourth	16·00	12·60	13·58	

By considering the two sexes together, and combining the first two and the last two groups, we arrive at the widest difference which the above table exhibits, and learn that, when there was little or no mental impairment, epilepsy began one

year earlier, as a mean, than it did in thoso individuals who exhibited, more or less marked, intelleetual deterioration.

There are, however, in the above numbers sueh wide differenees that I would attaeh eomparatively little value to the inferenees from them. These are owing, of eourse, to the exaggerated influences whieh one or two aeeidental or extreme variations necessarily exert upon mean results, when the latter are ealeulated from a eomparatively small number of eases.

One sexual differenee is to be notieed throughout, and it is, that in eaeh elass the mean age at eommeneement is less for the female than the male sex; and this agrees with the general result already stated (page 127).

If we adopt the double grouping for eaeh sex respectively, we find the following result:—

Mental class.	Mean age of Males.	Mean age of Females.
First and second ...	15·63	11·35
Third and fourth ...	19·25	13·30

From this table we learn that the general proposition first stated holds good with regard to eaeh sex separately; and further, that there is a greater differenee between those of the male sex than between those of the female.

By either method, therefore, the result is the same, and we must answer the question with whieh this subjeet was opened in the negative, viz., *that the mental c ondition of epileptics does not depend upon the age at which the disease commeneed.*

And it appears further, that, 1. Late, rather than early eommeneement is a predisponent to intellectual failure; 2. That this is true whether we divide the eases at the tenth, sixteenth, or twentieth years; and, 3. Whether we consider the two sexes together, or eaeh sex separately.

The next question has been already dealt with, viz.—

3. *Can the mental condition of epileptics be referred to sex?* By referring to § II., Semeiology, it will be seen that *the answer must be in the negative;* mental failure being absent and present in some of both sexes. It is, however, more eommon in the female sex; and there are other sexual differences whieh it is unneeessary to reeapitulate. (See page 46.)

Tho following question is one of considerable importance, viz.—

4. *Can the mental condition of epilepties be explained by the length of time during which they have suffered from the disease?* Is there a constant relation and direct proportion between the duration of epilepsy and the degree of mental decrepitude?

Esquirol says, "Les progrès vers la démence sont en rapport avec le nombre des années depuis l'invasion du premier accès;"* and this statement has been echoed by numberless authors. But in order to discover whether it is absolutely correct, I will show the mean duration of epilepsy in the four mental classes, and also the prevailing duration in the same groups.

Mental class.	Mean duration. Males.	Mean duration. Females.	Mean duration. Both sexes.
First	6·56 years.	9·75 years.	7·62 years.
Second	8·50 ,,	7·80 ,,	8·15 ,,
Third	9·00 ,,	10·00 ,,	9·55 ,,
Fourth	11·00 ,,	8·80 ,,	9·42 ,,

From this table it is evident that if we regard the two sexes together, and also combine the two extreme groups, the mean duration of epilepsy is less by a year and a half in those who exhibit little or no mental failure than it is in those who present, more or less marked, deterioration. It is also apparent that in the male sex there is a gradual increase in the mean duration, from the first to the fourth class; but that in the female sex this is not the case. If, however, in respect of the latter, the first two groups are combined, and also the last two, the mean duration is augmented in those who present mental failure.

But this fact must be noticed at the same time, viz., that in the female sex the highest degree of mental incapacity was exhibited by those whose entire disease had had a mean duration of but eight years, whereas there was no intellectual failure to be discovered in a much larger number of cases in which the mean duration of the disease was 9·75 years.

Again, the mean duration is that of the epilepsy, and not of the mental failure, nor of the time during which the attacks

* Des Maladies Mentales, Tome I., p. 288.

had lasted before the individual exhibited any intelleetual disturbanee. I found it impossible in many eases to arrive at the period of the disease in which the mind beeame affeeted; I have, therefore, stated the aetual duration of the affeetion at the time the patient eame under observation, and have made no attempt to fix the onset of mental failure upon some period in the past history of the ease. In many instanees the mind was said to have been impaired at an early period, in five individuals from the very first attaek; but the individuals did not eome under my own observation for several years; and therefore the mean duration of sueh eases, in so far as it forms part of an answer to the question now under eonsideration, is higher than it ought to be. The numbers, therefore, are only approximative in regard of the second, third, and fourth classes; but as these classes respeetively share equal ehanees, the relation between them may be eonsidered to be represented with an equal approaeh to aeeuraey. It is in eomparing them with the first elass that this souree of fallaey has to be borne in mind; for those who eonstitute the first elass had not, up to the time of observation, exhibited any intelleetual disturbanee, whereas those in the other elasses had done so, and for a variable period.

Holding, therefore, in reeolleetion the prineiple stated in the preeeding paragraph, we eannot but eonelude that, as the differenee between the mean duration of the first elass and of the fourth is but 1·80 year, the influenee of duration alone is trivial in regard of the mental eondition; for if epilepties who are mentally sound may have had their disease for a mean duration of 7·62 years, and epilepties presenting the greatest degree of intelleetual failure—and this in many instanees having made its appearanee early in the history of the ease—exhibit only an inerease of mean duration by 1·80 year, we eannot refer the mental impairment only to the time during whieh the disease had lasted.

We may, however, judge more aeeurately upon this question of "duration" by examining the number of eases in eaeh elass presenting quinquennially progressive periods of duration. With regard to sixty eases I have the information required, and can represent the facts in the following table:—

Duration.	First class.			Second class.			Third class.		
	Males.	Females.	Total.	Males.	Females.	Total.	Males.	Females.	Total.
Under 5 years	10	5	15	4	6	10	1	2	3
6 to 10 ,,	1	1	2	4	1	5	1	2	3
11 ,, 15 ,,	2	1	3	1	2	3	2	0	2
16 ,, 20 ,,	3	0	3	0	0	0	0	0	0
21 ,, 25 ,,	0	0	0	0	1	1	0	1	1
31 ,,	0	0	0	1	0	1	0	0	0
40 ,,	0	1	1	0	0	0	0	0	0
All periods ...	16	8	24	10	10	20	4	5	9

Duration.	Fourth class.			All classes.		
	Males.	Females.	Total.	Males.	Females.	Total.
Under 5 years	1	2	3	16	15	31
6 ,, 10 ,, ...	0	2	2	6	6	12
11 ,, 15 ,, ...	0	0	0	5	3	8
16 ,, 20 ,, ...	1	1	2	4	1	5
21 ,, 25 ,, ...	0	0	0	0	2	2
31 ,, ...	0	0	0	1	0	1
40 ,, ...	0	0	0	0	1	1
All periods	2	5	7	32	28	60

The first conclusion which is warranted from the above table is, that prolonged duration of epilepsy does not *per se* entail upon the sufferer mental impairment; for in three individuals exhibiting no mental failure the disease had existed from sixteen to twenty years, and in one it had lasted forty years.

The second conclusion is, that for the production of intellectual incapacity lengthened duration of the disease is not required; for of those who presented the worst mental condition there were three in whom the disease had existed for less than five years; and, as I have already stated, in some of these the process of deterioration commenced from the very first attack.

The third conclusion is, that the duration of epilepsy cannot be shown to exert any influence in the production of mental failure, or in the degree to which the latter is carried. This

conclusion is the only one to which we are warranted in arriving, if we regard the question in its true light. For, of sixty cases, there are twenty-four in the first class; twenty in the second; nine in the third; and seven in the fourth:—of those in whom epilepsy had existed for less than ten years, there were forty-three; and if we calculate,—in accordance with the simple proportion, irrespective of duration, in which the sixty cases were distributed throughout the four classes,—the relative numbers, irrespective of duration, in which forty-three cases should be found among the same classes respectively, we find them to be seventeen, fourteen, six, and five; and these numbers, with the exception of the second class, in which there is a difference only of one, are precisely identical with those which actually existed. Thus we may represent the facts:—

	First class.	Second class.	Third class.	Fourth class.
Sixty cases, distributed into ..	24	20	9	7
Forty-three cases (viz., those under ten years' duration), distributed in the same proportion, would equal ...	17	14	6	5
Actual numbers found in the four classes respectively ...	17	15	6	5

Again, if we calculate the proportion of those thirty-one cases which had existed for less than five years, we find they should be thus distributed among the classes, viz., 12, 10, 4, 3; and these numbers are for two classes identical with those actually found, and in the other two classes differing very slightly.

We must conclude, therefore, that *the duration of epilepsy is*, per se, *without influence upon the mental condition of the epileptic.*

There is another statement made by Esquirol to which some attention is necessary. That distinguished author has said, and others less authoritative have copied his remark, that when epilepsy commences after puberty "la raison se perd plus lentement."* I have already shown, page 167, that in fifty-nine cases falling under my own observation, it was not true that where the disease commenced before puberty a greater number exhibited mental failure; and I will now state the facts which will furnish an answer to the question whether the process of deterioration was more slow in its progress when the disease commenced after puberty.

* Des Maladies Mentales, Tome I., p. 288.

The following table gives the mean duration, in years, for each class respectively; the latter being divided into two series: the one having become epileptic before sixteen years of age, and the other after that period:—

	First class.			Second class.		
Age at commencement.	Males.	Females.	Total.	Males.	Females.	Total.
Under 16 years	10·00	5·27	8·28	12·40	8·83	9·30
Above 16 ,, ...	3·80	2·50	3·70	5·20	7·00	6·00
Difference	6·20	2·77	4·58	7·20	1·83	3·30

	Third class.			Fourth class.		
Age at commencement.	Males.	Females.	Total.	Males.	Females.	Total.
Under 16 years	0	24·00	24·00	0	9·75	9·75
Above 16 ,, ...	9·00	6·50	7·75	4·00	5·00	4·50
Difference		17·50	16·25		4·75	5·25

From this there is evidence to show that when epilepsy begins before puberty it may have a longer mean duration,—in each sex separately, and in the two sexes collectively,—before being accompanied by mental failure, than it has when commencing after sixteen years of age: the difference between the means being $4\frac{1}{2}$ years.

Again, each progressive stage of mental deterioration is arrived at with a less mean duration when the disease commences after sixteen years of age than when it begins before: the difference between the means being three, sixteen, and five years.

It is evident, therefore, that instead of M. Esquirol's statement being correct, the reverse of the proposition is true; and we may assert that when epilepsy commences after puberty, the intellectual condition is impaired more rapidly.

The general conclusion, therefore, in regard of age at commencement and the duration of the disease, is of much interest in relation to the mental condition of epileptics; for, while on the one hand neither age *per se*, nor duration *per se*, can be shown to determine the presence of intellectual failure, or the degree to which that deterioration may be carried; there is, on the other hand, evidence to show that an early commence-

ment of the disease lessens the probability of mental incapacity, both as regards the fact of its occurrence at all, and also the rapidity with which it will be brought about. A late commencement of the disease, on the contrary, is more likely not only to entail intellectual failure, but to develop that condition speedily.

We pass now to the consideration of another class of conditions, and ask—

5. *Can the mental condition of the epileptic be referred to the absence, presence, or degree of presence of those motorial phenomena which exist during the interparoxysmal period?*

In order to answer this question, we have simply to compare the four mental classes with those four classes in regard of motility, which have been already described in the chapter on Semeiology, p. 61.

The following table will illustrate their relations:—

Number of mental class.	First class motor.			Second class motor.			Third class motor.			Fourth class motor.			Cases. Total number in mental classes.
	M.	F.	Both.	M.	F.	Both.	M.	F.	Both.	M.	F.	Both.	
First	5	2	7	5	5	10	4	1	5	2	0	2	24
Second	0	3	3	4	2	6	2	2	4	2	0	2	15
Third	1	2	3	2	2	4	1	1	2	0	0	0	9
Fourth	1	1	2	1	3	4	0	0	0	0	0	0	6
Total of cases in motorial classes.	7	8	15	12	12	24	7	4	11	4	0	4	54

Here there are 54 patients, distributed, according to their motorial condition, into 4 groups, containing respectively 15, 24, 11, and 4. The same 54 cases are also distributed, according to their mental condition, into 4 groups, containing respectively 24, 15, 9, and 6 individuals. It is, therefore, evident that the two principles of grouping do not furnish the same numerical result; but it is interesting to observe that the sums of the first two of each, and of the last two of each, are respectively equal to one another.

In order to ascertain the influence, if any, which the motorial condition may exert upon the mental, let us see how the cases which form each separate motor class are distributed among the

mental classes; comparing this distribution with that which we might calculate from the distribution,—in regard of mind, but irrespective of motility,—into, viz., 24, 15, 9, and 6.

Total number of cases.	Number of mental class.	Number in mental class.	Number of motor class.	Number in motor class.	Number calculated.	Actual number observed.	Difference.
54 :	1st	24	: : 1st	15 :	6·6	7	+ ·4
	2nd	15			4·1	3	− 1·1
	3rd	9			2·5	3	+ 0·5
	4th	6			1·6	2	+ ·4
54 :	1st	24	: : 2nd	24 :	10·6	10	− ·4
	2nd	15			6·6	6	− ·4
	3rd	9			4·0	4	=
	4th	6			2·6	4	+ 1·4
54 :	1st	24	: : 3rd	11 :	4·8	5	+ ·2
	2nd	15			3·0	4	+ 1·0
	3rd	9			1·8	2	+ ·2
	4th	6			1·2	0	− 1·2
54 :	1st	24	: : 4th	4 :	1·7	2	+ ·3
	2nd	15			1·1	2	+ ·9
	3rd	9			0·8	0	− ·8
	4th	6			0·4	0	− ·4

From this it is perfectly evident that the influence of motorial upon mental conditions is extremely trifling; inasmuch as in each motor class there are only those numbers of the several mental classes which would be found irrespective of motor conditions. So that, given a certain number of epilepties, singled out and grouped together by the fact of their presenting a particular condition of motility, the numbers of these which are found in four different conditions as regards mind, are almost identical with those which would have been found in an equal number of epilepties not marked by that particular motor condition. And, further, this is true not only of one motor group, but of them all.

But inasmuch as the numbers actually observed are not pre-

cisely identical with those which result from calculation, it is interesting to inquire whether any principles of variation can be detected. For although the influence of motor upon mental condition is extremely trifling, there appears to be a certain influence; and we have to learn whether this is apparent only, and can be referred to merely accidental causes, or whether it results from some constant or distinct relation of the two classes of phenomena.

If we add together the *calculated* numbers of the first and second mental classes, and compare these with the numbers *observed* in the same two classes; and proceed in a similar manner, taking two classes at a time, throughout, we find,— 1. That the first motor group contained fewer of the better mental groups and more of the worse than would result from simple calculation. 2. That a similar relation existed in regard of the second motor group; and that the difference was more considerable. 3. That in the third motor the relation was reversed, there being more of the better mental class, and fewer of those in whom the mind was seriously impaired. And, 4. That a similar relation existed in the last motor group, the difference being more striking than in the third.

Adding the first and second mental groups of the first and second motor classes together, and comparing these with the third and fourth mental groups, of the first and second in regard of motility; and performing a similar process in respect of the two last groups, we find the differences to be —1·9 and +2·3; and +2·4 and—2·2. Therefore the conclusion to which we arrive is, that when motility is not at all, or only slightly affected, the mental condition is worse than the average; and, on the contrary, when motility is disturbed to a considerable degree, the mental condition is better than the average.

Thus then, *although the abnormal motorial state, as judged of during the interparoxysmal period, exerts a very trifling influence upon the mental condition of the epileptic, that slight influence which it does appear to possess is favourable, rather than the reverse.* At all events, the two kinds of disturbance are antagonistic rather than helpful to each other.

The next question we have to consider is:—

6. *Can the mental condition of the epileptic be referred to the state of his general, organic health?*

According to a principle already described in Chap. III., Semeiology, page 72, epilepties may be divided into four classes, separated from each other by the absence or presence, and the degree of intensity when present, of deterioration in general or physical health. In the first class, so far as regards organic health, the patients are strong and well; in the remaining three they present progressive stages of physical degeneration.

We have, therefore, in order to answer the question now propounded, to examine the inter-relations of these classes with those which may be formed by a regard to the mental condition. In fifty-seven cases the several elements of the inquiry are present; and they may be represented thus:—

Number of mental class.	1st class, organic.			2nd class, organic.			3rd class, organic.			4th class, organic.			Total number in mental classes.
	M.	F.	Both.	M.	F.	Both.	M.	F.	Both.	M.	F.	Both.	
First	8	3	11	5	5	10	2	0	2	1	0	1	24
Second	5	6	11	2	2	4	2	0	2	0	0	0	17
Third	2	1	3	1	1	2	1	1	2	0	0	0	7
Fourth	4	3	7	0	2	2	0	0	0	0	0	0	9
Total number in organic classes	19	13	32	8	10	18	5	1	6	1	0	1	57

From a simple glance at the above table it is evident that the two series of groupings furnish very different results. The numerical frequency of the second group is nearly the same in each, but at either extreme the divergence is considerable. Of the first class mentally, there are 42·46 per cent. who belong to the first class in regard of general health; in the second class mentally there are 64·70 per cent. of the first group organically; of the third there are 42·85; and of the fourth, 77·77 per cent.

But the influence of general organic conditions upon the mental state may be more accurately represented by a comparison similar to that which was effected in regard of motorial phenomena.

Irrespective of organic condition, fifty-seven patients are

found distributed, in accordance with their mental capacity, into four groups, containing respectively 24, 17, 7, and 9 individuals. In the first class, in regard of organic health, are 32 individuals, and the question is, whether these are distributed in a similar proportion. If they are, the introduction of a fixed element, viz. the organic condition, has no demonstrable influence upon the mental state; if they are not, some influence is exerted, and we have to learn its nature. A similar process may be adopted with regard to each group; but as the numbers are so small in the third and fourth, they will be combined. The results may be given thus:—

Total number of cases.	Number in mental class.	Number in organic class.	Number required.	But actual number observed.	Difference.
57	24	32	13·4	11	− 2·4
	17		9·5	11	+ 1·5
	16		8·9	10	+ 1·1
57	24	12	7·5	10	+ 2·5
	17		5·3	4	− 1·3
	16		5·0	4	− 1·0
57	24	7	2·9	3	+ 0·1
	17		2·0	2	=
	16		1·9	2	+ 0·1

The most important fact represented by the above table is—1. That the influence of organic upon mental conditions is slight; each large group of the former containing, with only trifling variations, a similar proportion of the latter. But, 2. Those variations which are found, reach their maxima in the extreme classes (organic); so that if we regard the table as a whole, we see that there are, relatively, fewer than there ought to be of the first mental class, and a larger number of the other three in the first organic class; whereas, in the worst (fourth) groups, as regards general health, precisely the reverse is observed.

The conclusion therefore is, that where the general health is exceedingly good, there is a greater tendency than exists in epileptics *per se*, to deterioration of the mental condition; but

so soon as the general health fails, and in the degree to which it fails, does the mental condition relatively improve.

But, in reply to the question asked at the commencement of this subject, we must say that *the mental condition of epileptics cannot be wholly referred to their state in regard of general health*; for a sound state of mind, or either degree of mental failure, may co-exist with perfect organic health, and a sound mental condition may also coexist with extremely impaired nutrition, strength, and temperature.

We now proceed to the consideration of another class of conditions, viz. the attacks, and the influence they exert upon the mental capacity of the epileptic.

7. *Can the intellectual state of the epileptic be referred to the number of attacks he may have suffered?*

In order to answer this question, I have calculated the number of seizures experienced by fifty individuals. It is obvious that, in a matter of history extending sometimes over many years, perfect accuracy is, in some cases, impossible. Patients are said to have had, on an average, one attack every day, week, month, or three months; or to have had three attacks daily; and this for a certain number of years: but all who are in the habit of endeavouring to write an accurate history of a case know that such statements frequently vary from the truth, representing the impressions of particular periods rather than the facts of all periods. However, we may regard these sources of fallacy as applicable nearly equally to all cases, and hence the general result will be, in regard of relations, approximately true; although, in regard of actual facts, it may be untrustworthy.

The plan which I have adopted has been to take first the mean number of an individual's paroxysms in relation to fractional parts of a day, to a day, or to two, three, or more days; and then to multiply this number by that of the days during which the disease has existed. Having accomplished this for fifty patients, I have formed four groups of these fifty in regard of their mental condition; and have calculated the mean number of attacks in each group separately.

In the following table the actual number of cases observed in each sex is given separately; then, in regard of each of the

four mental groups, the minimum number of attacks; the maximum number; and the calculated mean.

Number of mental class.	Number upon which observations made.			Number of attacks in males.			Number of attacks in females.		
	Males.	Females.	Total.	Minimum.	Maximum.	Mean.	Minimum.	Maximum.	Mean.
First	11	7	18	4	18,455	2,117	8	7,280	1,338
Second	10	8	18	6	1,150	211	24	730	270
Third	4	4	8	120	5,475	1,493	73	3·650	1,417
Fourth	1	5	6	48	48	48	100	45,040	9,630

Some of the numbers appear so enormous, that it is only right to observe,—and to remark upon the most extreme is sufficient,—that in the maximum case, in the fourth class of females, the individual was said to have had as an average, six attacks in the twenty-four hours, and to have suffered in this way and to this degree for more than twenty years.

From this table we may gather the following facts:—1. That a very large number of attacks does not necessarily entail mental failure. Eleven males had suffered, as a mean, upwards of two thousand seizures; seven females more than one thousand, and yet I could discover no traces of intellectual deterioration.

2. That mental discomfiture may appear after a comparatively small number of seizures, viz. after 6, 24, and 48.

3. That there is no constant proportion between the number of attacks and the degree of mental failure which may be present. One male, whose attacks numbered only 48, was worse than four others, the mean number of whose seizures was 1,493, the smallest number in any individual being 120.

In conclusion, therefore, *we cannot refer the mental failure of an epileptic, nor its degree when present, to the number of the attacks he has experienced.*

8. *Can the mental failure of the epileptic be referred to the frequency of the attacks?*

There are two modes in which we may represent the frequency of epileptic seizure: in the *one*, we may state the period of time which elapses between the recurrence of attacks, the latter being either single, or consisting of a series of three or more. Thus, it often happens that a patient experiences an attack, and that

this is rapidly followed, within a few hours, by a series of three or more paroxysms; that then there is an interval of seven, fourteen, twenty-one, or more days, and after it a renewal of the series of convulsions. The frequency of attacks, in such cases, would be represented, respectively, by a week, fortnight, three weeks, &c. Such cases, however, differ much from those in which only one attack occurs at a time, and this is then followed by the several periods of quiescence. In relation to time, as divided into days, weeks, months, &c., they are the same; but in relation to the absolute frequency of epilepsy, —and this in some degree may be taken as a measure of its severity,—they are very different.

We must regard the mental condition of the epileptic in relation to each of these methods of representing frequency of attacks. In the first table the different degrees of frequency are stated, and then the number of males and females in each mental group whose attacks occurred at each of these several degrees :—

	1st class.			2nd class.			3rd class.			4th class.			General total.
Frequency.	M.	F.	Total.	M.	F.	Total.	M.	F.	Total.	M.	F.	Total.	
Day . .	2	1	3	1	0	1	1	3	4	1	2	3	11
Week .	1	0	1	0	1	1	0	0	0	0	0	0	2
Fortnight	2	3	5	1	6	7	2	1	3	0	2	2	17
Month .	4	2	6	4	1	5	1	0	1	2	1	3	15
More than month .	3	0	3	4	1	5	0	0	0	0	0	0	8
Very irregular .	4	2	6	0	1	1	0	1	1	0	0	0	8
Number in each class	16	8	24	10	10	20	4	5	9	3	5	8	61

From this table it is evident that when attacks are very frequent it is more common to find mental failure than mental integrity: for among eleven cases who presented daily seizures there were only three in the first class, and eight in the second, third, and fourth. If sixty-one cases divided into four mental groups gave, including all degrees of frequency of seizure, the numbers 24, 20, 9, and 8; eleven cases distributed in the same proportion would be, 4, 3, 1, and 1. But by singling out those cases in which the attacks were of daily frequency, the

numbers are 3, 1, 4, and 3. From this it is evident that mental failure and frequency of attacks are commonly associated.

The relation of this element of frequency to the mental condition may be, however, more fully represented by comparing, as we have done before, the results of observation with those of calculation. Knowing the frequency with which, irrespective of mental state, attacks may occur in sixty-one individuals; and knowing the numbers which, irrespective of frequency, the several mental groups may contain; let us see what is the actual frequency observed in each group, as compared with that which might be obtained from calculation. The first and second degrees of frequency are combined, the last is omitted; and the third and fourth mental groups are added together.

Total number of cases.	Number at different degrees of frequency.	Number of each mental class.	Number required.	But actual number observed.	Difference.
61	13	1st. 24	5·1	4	− 1·1
	17		6·6	5	− 1·6
	15		5·9	6	+ ·1
	8		3·1	3	− ·1
61	13	2nd. 20	4·2	2	− 2·2
	17		5·5	7	+ 1·5
	15		4·9	5	+ ·1
	8		2·6	5	+ 2·4
61	13	3rd and 4th. 17	3·6	7	+ 3·4
	17		4·7	5	+ ·3
	15		2·5	4	+ 1·5
	8		2·2	0	− 2·2

From this table it appears that when mental integrity is preserved there are fewer (than there ought to be from simple calculation) with a high rate of frequency. The numbers here are somewhat distorted, owing to the presence of so many as six of the eight cases with "very irregular" frequency.

In the second mental class, where the degree of mental failure is very slight, there are, still, fewer than there ought to be with a high rate of frequency, and more than there ought to be with a low rate.

In the third and fourth classes, where the mental powers have been seriously impaired, there are too many with a high rate of frequency, and too few with the low.

When the attacks are "very irregular" and uncertain in their recurrence, a much more favourable mental result ensued. For example, there were eight cases in which these long and uncertain intervals had been observed; but of these six were found in the first class, one in the second and third respectively, and none in the fourth. If no relation existed between the mental condition and the frequency of seizure, these eight cases should have been distributed thus:—in the first class, 3·1; in the second, 2·6; in the third and fourth, 2·2.

The conclusion, therefore, is obvious, that the presence and the degree of mental failure have a constant and direct relation to the frequency of the seizures.

But if it be asked, Is frequent recurrence of the attacks necessarily followed by mental failure? and is the patient in whom the attacks are rare necessarily free from such deterioration? the answer to each query must be, emphatically, *No.* For there were three in the first class whose attacks had a daily frequency; and there were three in the fourth class in whom they recurred but once in the month.

Frequency of recurrence of the attacks is one condition commonly associated with mental failure; but it is not the sole condition of such result, neither is it a necessary condition.

The mean frequency of single attacks may be represented in the following table:—

Time of recurrence.			Mental classes.								
			1st.		2nd.		3rd.		4th.		
	M.	F.	Total.	M.	F.	M.	F.	M.	F.	M.	F.
I. Under one day	2	2	4	1	0	0	0	1	1	0	1
II. From 1 to (2× 1) 2 days	2	4	6	0	0	1	1	0	0	1	2
III. From 2 to (2× 2) 4 days	2	2	4	2	2	0	0	0	0	0	0
IV. From 4 to (2× 4) 8 days	2	3	5	1	0	0	1	0	2	1	0
V. From 8 to (2× 8) 16 days	3	6	9	2	2	1	4	0	0	0	0
VI. From 16 to (2×16) 32 days	11	6	17	3	2	4	1	3	1	1	2
VII. From 32 to (2×32) 64 days	2	2	4	2	1	0	1	0	0	0	0
VIII. From 64 to (2×64) 128 days	4	0	4	2	0	2	0	0	0	0	0
IX. Above 128 days	1	0	1	0	0	1	0	0	0	0	0
	29	25	54	13	7	9	8	4	5	3	5

From this table it appears that the numbers in the first and second classes increase, and that those of the third and fourth diminish, as we advance towards lower rates of frequency, *i. e.* as the frequency diminishes. Thus, in the highest rate of frequency, the first and second classes are to the third and fourth as 25 : 75; in the fourth, as 40 : 60; in the sixth, as 58 : 41; and above that, as 100 : 0.

This table furnishes, therefore, results which are similar to those furnished by the preceding, inasmuch as it shows that there is a general relation between frequency of attack and degree of mental failure; but it illustrates, still further, the fact that these two elements are not necessarily associated with each other.

To my own mind it appears that this mode of regarding the frequency of attack furnishes a measure of the severity or intensity of the disease, rather than a statement of its relation to time; and if such be correct we may infer, that although notable severity of disease is commonly associated with mental incapacity, and slight intensity of the affection with mental integrity, yet the mental condition is not solely dependent upon those conditions, it being sometimes absent when there is great severity, and sometimes present when there is but a trivial degree of intensity, *quoad* the reproduction of attacks.

9. *Can the mental failure of the epileptic be referred to the severity of the convulsive paroxysms?*

It is extremely difficult to estimate the severity of the attacks which epileptics suffer. The mere force of convulsive movement is dependent—not entirely, but in great measure—upon the muscular vigour of the individual; and, added to the absence of any fixed standard in regard of those cases which frequently came under my own observation, there is the difference of report by different individuals with regard to those cases not witnessed by myself during the paroxysms.

In many cases the mind has been much affected when there has been but trifling visible spasm; and in many the mind has been unaffected when the convulsions have been violent. But the numbers of cases with regard to which I have accurate evidence on this point, are too small for any tabular statement.

If we judge of the severity of a paroxysm by the length of

its succeeding coma,—a mode of judging which is inferential only, and therefore of comparatively little value,—we obtain the following result:—

Duration of coma—mean.	Mental class.
1·07 hours	1st class.
1·09 ,, ...	2nd ,,
1·25 ,, ...	3rd ,,
0·62 ,, ...	4th ,,

From this it appears that the mean rises slightly from the first to the third class, but that it is less in the fourth than in the fifth. It has been already stated (page 115) that in many of the worst cases mentally there is little or no coma, and that Dr. Bucknill has drawn attention to the fact that in the epilepsy which complicates mental insanity the coma is frequently absent altogether.*

10. *Can the mental condition of the epileptic be explained by the nature of the convulsive paroxysms?*

M. Esquirol has made the following statement:—"Les vertiges ont une influence plus active, plus energique sur le cerveau que ce qu'on appelle le grand mal, ou l'accès complet."† A similar opinion has been recorded by Foville, viz.:—"La dégradation intellectuelle arrive plus constamment et plus vite chez les malades affectés de vertige, ou *petit mal*, que chez eux qui n'ont que des convulsions violentes, ou *grand mal;*"‡ and M. Morel agrees with his countrymen in this opinion.§ Dr. Watson, on the other hand, states that the mental deterioration of the epileptic "more probably depends upon the repetition of the fits than upon their precise nature or severity;"‖ and our greatest English author upon this question, the late Dr. Marshall Hall, placed mania and amentia only among the results of "epilepsia gravior," and that of spasmodic, laryngismal form;¶ and I am quite confident,

* Asylum Journal, 1855.

† Traité des Maladies Mentales, Tome I., p. 288.

‡ Dictionnaire de Médecine et de Chirurgie, art. "Épilepsie."

§ Études Cliniques, Tome I., p. 320.

‖ Principles and Practice of Physic, Vol. II., p. 633.

¶ The Physiology of Epilepsy, and of Paroxysmal Apoplexy, Paralysis, Mania, &c. Third Edition.

from the remarks which I have heard made by many of those members of the profession with whom I have had the honour to come into personal contact, that the latter belief, viz. that of Dr. Marshall Hall, is more generally held than the former, viz. that of MM. Esquirol and Foville.

The question is not very easy to answer satisfactorily, and for this reason, that in many cases the two forms of attack—"le haut mal" and "le petit mal"—coexist. I have shown already that the attacks of the slighter form do not take the place of the severer, but that, on the contrary, those individuals who present "le petit mal" have their attacks of "le haut mal" more frequently than do those who suffer only from the latter.* Therefore, in making any general statement with regard to the mental condition of those in whom "le petit mal" was present, as compared with those in whom it was absent, it must be remembered that such statement carries with it an increased frequency of the severe attacks, which increase has been shown† to be detrimental to the mental powers.

The relative frequency of "le petit mal" in the four mental classes may be thus exhibited:—

Numbers of				With "le petit mal."			
Males.	Females.	Total in	Mental classes.	Males.	Females.	Total.	Per-centage.
16	8	24	First ...	6	2	8	33·33
10	10	20	Second ...	4	5	9	45·00
4	5	9	Third ...	1	2	3	33·33
4	5	9	Fourth ...	1	5	6	66·66
34	28	62		12	14	26	41·93

From this it appears that the general per-centage of "petit mal," viz. 41·93 per cent., is very unequally distributed among the several mental classes; the first and third falling below, the second rising slightly above, and the fourth considerably above, the average.

If we combine the two extreme groups, we have a difference of ten per cent. between the mean of each; "le petit mal"

* *Vide* page 154.

† Page 184.

being found in 49 per cent. of the third and fourth groups, and in 39 per cent. of the first and second. And, again, "le petit mal" is present in only 33 per cent. of the first class, but in 48 per cent. of the second, third, and fourth.

The attacks of epilepsia mitior are, therefore, relatively more common among those whose mental condition is impaired than among those who exhibit no intellectual failure.

Again, of the thirty-six individuals without attacks of "le petit mal" forty-four per cent. belonged to the first mental class, whereas of the twenty-six in whom "le petit mal" was present, but eight, or thirty per cent., were in the first class. And further, of those without slight attacks only twenty-five per cent. were found in the third and fourth groups; whilst of those in whom epilepsia mitior occurred, thirty-four per cent. were in the worst mental classes.

We conclude, therefore, that when attacks of "le petit mal" are present the mind is more frequently affected, and affected gravely, than when the individuals are free from the slighter seizures.

We must, from the preceding table, admit, further, the following propositions:—that the mind may suffer, and that severely, even to the fourth degree, without "le petit mal" having occurred; and, on the other hand, that "le petit mal" may exist without entailing on the sufferer any mental incapacity.

We conclude, therefore, that epilepsia mitior is not essential to, and that it does not necessarily produce, mental failure. The one may exist without the other, although they appear, when coexistent, to hold some important mutual relations.

But, while we admit these facts and the conclusions warranted from them, there are other facts of great importance to be at the same time remembered. The mind of an epileptic may undergo gradual and extreme injury, and yet the only attacks from which he suffers, or has suffered, are those of "le petit mal." (For an example of this relation see Case IX.) It is evident, therefore, that the element in epilepsy through which the mind is damaged exists in a case of "le petit mal;" it is not necessarily present in the violent convulsions of "le haut mal," nor in the interparoxysmal state of either case; it

is not necessarily associated with epilepsia mitior; but it is more commonly coexistent with that form of the disease, when combined with the severe, than it is in the severer form without the slighter.

The mental condition of the epileptic, moreover, cannot be referred solely to the frequency with which attacks of "le petit mal" occur; and this fact is illustrated by the following table:—

Frequency of "le petit mal."	Mental classes. 1st.	2nd.	3rd.	4th.	General total of frequency.
Very frequent—more than one in a day	0	1	0	2	3
Frequent—attacks every 2 to 6 days ...	4	4	0	1	9
Medium—about once a week	1	0	1	1	3
Occasional—every fortnight or 3 weeks	2	3	1	0	6
Rare—every month, or longer... ...	1	1	1	1	4
Numbers in each class	8	9	3	5	25

It appears that in no case in which the attacks were "very frequent" did the mind retain its integrity, and that in two of three cases in which great frequency was observed the mind was in its worst condition. But it is also evident that the intellectual condition of the patient may be free from failure, when attacks of "le petit mal" have occurred frequently; and on the other hand, there may be the most serious impairment, with "rare" occurrence of epilepsia mitior.

It must not be thought that the difference of mental condition in these cases depends upon the duration of the disease, for of the five in the first class, where frequency of attack was from two to seven days, the mean duration was nine and a half years, the maximum being twenty and the minimum two; whereas of the four belonging to the worst mental class, who presented the same frequency of seizure, the mean duration was but seven years, the minimum being five and the maximum ten.

Inasmuch as mental deterioration is found associated with both forms of attack, and inasmuch as, generally speaking, it has some direct proportion to the frequency of either form; and inasmuch as, further, the frequency of the severer forms of seizure is greater in those cases which present the milder form

of paroxysm than it is in those from whom the latter is absent, it may be conjectured that, after all, the mental condition of the patient is determined by the number of attacks, which in some form or another he may have experienced. We have to discover, therefore, whether this conjecture is in accordance with facts; and such discovery may be made by referring to the following table. There are here placed for comparison the first and fourth classes, in respect of the number of attacks, of both kinds, that four in each class had experienced:—

FIRST CLASS.

	In one year.				
	Gravior.	Mitior.	Total.	Duration in number of years.	Total number of sttacks.
	182	121	303	20	6,060
	1,095	12	1,107	17	18,819
	6	52	58	14	812
	20	52	72	5	360
Mean ...	327	75	385	14	6,512

FOURTH CLASS.

	In one year.				
	Gravior	Mitior.	Total.	Duration in uumber of years.	Total number of attacks.
	20	52	72	5	360
	182	182	364	5	1,820
	242	242	484	8	3,872
	17	2,190	2,207	10	22,070
Mean ...	110	666	781	7	7,030

By comparing the last case in the first group with the first case in the fourth group, we have this fact: that neither one of the following elements—kind of attack, frequency of either form, rate of frequency, nor duration in years,—is either by itself, or in combination with the other elements mentioned, sufficient to determine the mental condition of the patient; for the two cases agreed precisely in all these respects, and yet in the one there was no trace of mental deterioration discoverable, whilst in the other the failure had been carried to the worst degree.

Again, we learn also that such a high rate of frequency as eleven hundred attacks in the year may exist for seventeen years without producing intellectual change; whereas, so low a

rate as seventy-two in the year may damage the mental condition most seriously, and that in five years.

The gross number of attacks of both kinds—*i. e.* of epilepsia gravior and mitior together—is not, therefore, the sole determining cause of the mental injury: nor is it demonstrably a powerful concomitant influence, or indication; for the difference between the first and fourth classes, in respect of the mean numbers of attacks of both kinds, is little more than five hundred, or one-fourteenth part.

The rate of frequency of the two kinds of attacks taken together is of no great moment; for although the mean ratio is higher in the fourth class than in the first, it was much higher in two cases of the first than in two cases of the fourth.

With regard to epilepsia gravior, the rate of frequency may be very high without entailing mental failure; and, on the other hand, it may be low, and yet the mind may suffer much: the mean frequency of the four cases in the first class is nearly three times as high as that observed in the four cases of the worst class.

The most important fact, however, is with regard to the attacks of "le petit mal." Its rate of frequency in the fourth class was more than eight times as great as that observed in the first; and although it was higher in one case in the first group than in one of the fourth, a very considerable difference existed in regard of the other three. In one case only, which is not represented in the above table, have I observed a higher rate of frequency of "le petit mal" without notable mental failure. In the case referred to, the disease had existed for thirty-one years; the patient had suffered attacks of epilepsia gravior once in twenty-five days, and attacks of epilepsia mitior daily; but the only mental change which I could discover was a slight want of attention, resulting in forgetfulness of trifling passing events.

The evident conclusion from these facts is, that the mental condition of epileptics is more closely dependent upon attacks of "le petit" than of "le haut mal;" and that the degree of failure is in some general manner related to the frequency of the slighter seizures;—that while neither the one form of attack nor the other necessarily entails upon the sufferer mental injury;

and while great intelleetual deterioration may exist with either form, and without the other;—yet, that when the two forms co-exist, the mental failure occupies a more marked and more direct relation to the attacks of "le petit" than to the attacks of "le haut mal."

Another question of some interest is the following:—

11. *Can the mental failure of the epileptic be shown to depend upon the operation of a mental or emotional disturbance as the occasional cause of the first attack?*

It has been already shown (p. 132) that mental and emotional disturbances were referred to as the cause of their disease by twenty patients out of sixty-nine, *i. e.* by very nearly twenty-nine per cent. With regard to seventeen of these twenty, I was able to estimate the mental condition sufficiently to classify them; and they are thus distributed:—

Mental class.	Males.	Females.	Total.
First	5	3	8
Second	2	3	5
Third	0	3	3
Fourth	0	1	1
	7	10	17

From this it is evident that although epilepsy may have been occasioned by fright, distress, intellectual labour, or other psychical disturbances, it does not therefore entail upon the sufferer mental injury; for in nearly half of the cases owning this mode of causation, no trace of failure was detected in the mind.

And further, by comparing the numbers found in the above table with those in which is stated the general proportion of the several mental classes,* it is apparent that the mode of causation has little or no influence in determining the presence or degree of mental failure. Seventeen cases distributed, irrespective of their mode of causation, into four mental groups, according to the general numerical value of these groups, would be 6·5, 5·4, 2·4, and 2·4; an arrangement so near to that which is the result of actual observation, that the introduction of this eti-

* Given at page 43.

ologic circumstance may be regarded as without influence upon the mental condition.

We cannot, therefore, in conclusion, refer the intellectual failure of the epileptic to the fact that his disease has arisen through psychical disturbance.

C. The Motorial Condition of Epileptics in its several Relations.

The influence exerted by the motorial condition of the epileptic upon his mental state has been already examined, in an earlier portion of this chapter. See page 176.

The relation between different degrees of motor disturbance, and the frequency of the paroxysms, has also been exhibited. See page 157.

It remains, therefore, to discover the mutual influences exerted by the motor condition of the patients, and their state in regard of general, organic health.

Those individuals in whom tremor, clonic, and tonic spasm are present, do not exhibit any higher rate of frequency of attacks than do those from whom such disturbances of motility are absent. We may infer, therefore, that the conditions upon which the attacks depend, and those which cause the several disturbances alluded to, are not identical; and that neither one is the cause or effect of the other.

Again, we have seen that the mental condition of the epileptic appears quite independent of that which so affects him, as to induce tremor and spasm; and we have now to inquire whether these disturbances of motility are more common in those whose general health—as judged of by nutrition, strength, and temperature—is sound, or in those in whom it is impaired.

The facts which enable us to answer this question are arranged in the following table:—

Motor phenomena.	Present or absent.		Nutrition was: Above average in	Normal in	Depressed in
Tremor ...	Present in	Males	1	11	2
		Females	1	2	0
		Total	2	13	2
	Absent in	Males	1	7	2
		Females	0	5	1
		Total	1	12	3
Clonic spasm	Present in	Males	1	14	4
		Females	1	5	0
		Total	2	19	4
	Absent in	Males	2	3	1
		Females	0	8	1
		Total	2	11	2
Tonic spasm	Present in	Males	0	4	0
		Females	0	3	0
		Total	0	7	0
	Absent in	Males	1	4	0
		Females	0	3	1
		Total	1	7	1

Motor phenomena.	Present or absent.		Strength was: Above average in	Normal in	Deficient in	Temperature was: Normal in	Lower in
Tremor	Present in	Males	1	6	4	8	3
		Females	1	3	2	1	3
		Total	2	9	6	9	6
	Absent in	Males	1	5	0	7	0
		Females	0	4	2	1	2
		Total	1	9	2	8	2
Clonic spasm	Present in	Males	0	6	5	8	7
		Females	2	3	1	2	5
		Total	2	9	6	10	12
	Absent in	Males	2	3	0	4	0
		Females	0	6	2	5	2
		Total	2	9	2	9	2
Tonic spasm	Present in	Males	0	2	1	2	1
		Females	0	3	1	3	1
		Total	0	5	2	5	2
	Absent in	Males	1	3	1	3	1
		Females	0	2	2	2	2
		Total	1	5	3	5	3

The results to which this table conducts may be more readily appreciated by comparing, in regard of those who did and did not present the several forms of disturbance, the numbers per

cent. of those in whom the organic condition was that of depression. For example, of those in whom tremor was present, viz., 17, there were but 2 in whom nutrition was defective; whereas, of those from whom tremor was absent, viz., 16, there were three whose nutritive condition was represented as below the average. These proportions are, respectively, 11·76 per cent., and 18·75 per cent. In the same manner, the other motor phenomena, and each of the organic conditions, may be compared. I have selected, of course, for comparison, the deficiency, and not the excess or average amount of physical health; the question for solution being,—Does the motor disturbance depend upon impaired organic vigour?

Motor phenomenon.	Present or absent.	Nutrition defective, in—per cent.	Strength, deficient in—per cent.	Temperature depressed, in—per cent.
Tremor ...	Present	11·76	35·29	40·00
	Absent	18·75	16·66	20·00
Clonic spasm	Present	16·00	35·29	54·54
	Absent	13·33	15·38	18·18
Tonic spasm	Present	00·00	28·57	28·57
	Absent	11·11	33·33	37·50

From this table we learn—1, That neither tremor, clonic spasm, nor tonic spasm, depends solely on deficiency of either nutrition, strength, or temperature; since there is no constant relation between them.

2. That when *tremor* is present, nutrition is not so commonly deteriorated as it is when tremor is absent; but that the strength and temperature of the patient who is tremulous are very much more commonly below par than they are in the individual who is not tremulous.

Still, let it be borne in mind, that—although this is the case—tremor is present in a much larger number whose organic condition is altogether unimpaired, than it is in those who exhibit a deficiency; so that the one must not be regarded as the causative condition of the other because associated therewith. When tremor is present, temperature is defective in 40 per cent.; when tremor is absent, a lowered temperature is observed in but 20 per cent.; but even in the former case (where tremor is

present) there are sixty per cent. who do not exhibit any reduction of their temperature.

3. That with the presence rather than the absence of clonic spasm there is more commonly associated defective general health; and that in the particular of temperature this is very highly marked. In regard of the latter, let it be observed, that the proportion is so high that diminished temperature is—clonic spasm being present—more common than a normal temperature.

4. That when tonic spasm is present, neither nutrition, strength, nor temperature is so commonly impaired, as when tonic spasm is absent; and that, indeed, no one case was recorded in which—tonic spasm being present—the nutritive condition was below par.

Now, although these numbers actually represent the proportions in which particular motor phenomena co-existed with particular organic conditions; the general relation of the two kinds of interparoxysmal symptoms may be more fairly exhibited by a comparison of the classes into which it has been found convenient to distribute the epileptic patients. In the tables just given, tremor is examined in regard of nutrition, &c.; clonic spasm in relation to temperature, &c.; and so on; but in the following, the general character of the patients as regards motility is placed in comparison with their general organic health; and we find out how many of the first, second, third, and fourth motor classes respectively, exist in the first, second, third, and fourth organic classes, respectively.

Organic class.	1st class in motility.			2nd class in motility.		
	Males.	Females.	Total.	Males.	Females.	Total.
1. No impairment	5	5	10	9	6	15
2. Impairment of one kind...	2	2	4	2	5	7
3. ,, two kinds	0	1	1	1	0	1
4. ,, three ,,	0	0	0	1	0	1
Number in motor classes	7	8	15	13	11	24

Organic class.	3rd class in motility. Males.	Females.	Total.	4th class in motility. Males.	Females.	Total.	Number in organic classes.
1. No impairment	2	1	3	2	0	2	30
2. Impairment of one kind...	2	4	6	1	0	1	18
3. ,, two kinds	2	0	2	1	0	1	5
4. ,, three ,,	0	0	0	0	0	0	1
Number in motor classes	6	5	11	4	0	4	54

From this we see that of the forty-eight individuals who formed the first and second classes in regard of their general organic health, there were twelve, or 25·00 per cent. who exhibited marked motor disturbance; whereas, of the six who constituted the third and fourth classes, there were three, or 50·00 per cent., who suffered from notable motor symptoms. We may, therefore, infer that although the one kind of derangement is not necessarily associated with the other, yet the two kinds have a tendency to co-exist; or, in other words, that some impairment of general health is more commonly associated with some motor disturbance; and that the presence of unimpaired general health is more commonly allied with the absence of motor disturbance—or with the latter carried to a very slight degree—than with the opposite conditions. For, among twenty-four individuals who exhibited some degree of impairment of their organic health and strength, there were nineteen who also presented motor disturbance; and of the thirty patients whose general health was uninjured, ten exhibited no motile derangement, and twenty-five, either an entire absence of such derangement, or its presence to a very feeble degree.

D. The Organic Condition of the Epileptic in its Relations.

The physical health of the epileptic having been already examined in regard of epileptics generally (page 69); in relation to the frequency of attacks (page 158); to the state of the patient's mind (page 178); and to the degree of motor disturbance which exists in the interparoxysmal period, there is only one point to which further reference will be made in the present

section; viz., the influence exerted by the duration of epilepsy upon the general health, and *vice versâ*.

The duration of epilepsy, in those who exhibited no impairment of general health, gave, as a mean, eight years; and the same mean was given by those who suffered all degrees of deterioration in physical health. But the following table, which shows the prevailing duration in each (organic) class, will illustrate more accurately the relation of these two conditions:—

Duration.	1st class—organic.			2nd class—organic.			3rd & 4th classes—organic.		
	M.	F.	Both.	M.	F.	Both.	M.	F.	Both.
Under 2 years ...	3	1	4	6	5	11	1	0	1
From 3 to 4 years	5	5	10	1	1	2	1	0	1
,, 5 ,, 6 ,,	2	4	6	0	1	1	1	0	1
,, 7 ,, 8 ,,	2	1	3	1	1	2	1	0	1
,, 9 ,, 10 ,,	1	2	3	0	2	2	0	0	0
,, 11 ,, 20 ,,	5	2	7	1	1	2	1	0	1
,, 21 ,, 30 ,,	0	1	1	0	0	0	0	1	1
,, 31 ,, 40 ,,	0	1	1	0	0	0	1	0	1
	18	17	35	9	11	20	6	1	7

From this it appears that of those thirty-seven epileptics whose disease had existed for less than six years, there were twenty, or 54 per cent., belonging to the first class, in regard of organic health; whereas of the twenty-five whose epilepsy had existed from seven years and upwards, there were fifteen, or 60 per cent., who exhibited no deterioration of their health. It is evident from this that the health may be unimpaired, even although epilepsy is prolonged for many years; and, that so far as these numbers show the tendency is towards impairment at an early period in the disease. This latter inference is borne out by regard to the second class, wherein we see that thirteen of twenty exhibited their failure of health at less than four years' duration.

Where, however, on the contrary, marked organic deterioration is present, it is relatively more common to find a prolonged duration of the disease than it is in those groups which exhibit little or no impairment of the general health.

IV. The Consequences of Epilepsy.

Upon this subject much has been written, but care does not appear to me to have been taken in order to separate the consequences of epilepsy from those which may be due to other diseases; neither have the conditions which accompany epilepsy been shown to be consequences of that affection. It is true that in many epilepties more or less disturbance is found in one or the other, or in all of the great divisions of vitality: in one the mind suffers, in another the general health is impaired, in a third there are evidences of disordered motility, whereas in a fourth there may be combinations of any two or more of these derangements, and in a fifth there may be no deviation that is apparent from perfect health. But it has been assumed, when any of these disturbances are found, and especially when they exist in the region of mind, that they are the "consequences" of the attacks. This has been done, in my opinion, without sufficient evidence; and it appears to me extremely difficult to ascertain what are, or may be, the consequences of the disease.

If we refer to authorities, but little satisfactory information can be gained. M. Sandras observes that, "Ce n'est que quand le désordre est arrivé à un certain degré que le trouble cérébral s'ajoute aux autres misères de cet état . . . la maladie nerveuse épileptique ne trouble pas sérieusement l'intelligence . . . et que celle-ci n'est altérée chez les épileptiques que quand le désordre matériel qui a en l'épilepsie pour une de ses conséquences est arrivé au point de troubler notablement les fonctions cérébrales toutes ensembles."* But Dr. Radcliffe says—and of the correctness of his opinion I have been long convinced—that "the history of epilepsy may begin in idiotcy;"† and Esquirol is of the same opinion.‡

In order to arrive at some definite conclusion on this question, I have examined its several bearings in fifty-three epilepties; in thirty males, and twenty-three females: and the mode of examination has been to compare the interparoxysmal condition of groups of these patients, separated from one another by the length of the duration of their disease. If the several ailments

* Traité pratique des Maladies Nerveuses, Tome I., p. 202.

† Epilepsy and other Convulsive Affections, p. 140.

‡ Des Maladies Mentales, Tome I., p. 288.

which are described as consequences of epilepsy are in reality its consequences, they ought to be found with frequency and severity in proportion to the time that the individuals have suffered. If, on the other hand, the time during which the disease has existed exerts little or no influence upon the frequency or severity of these ailments, then we may infer that they are not related to epilepsy in the manner that is supposed.

It may be said that there are other elements besides the duration of epilepsy which may influence the production of its "consequences," viz., the frequency of seizure, the severity of the attacks, the age of the patient, and so on. But to this I may reply—

1. That the frequency of seizure, as a rule—at all events in these very cases that are examined,—augments rather than diminishes with the duration of the malady; so that the "consequences," so called, of epilepsy would, if induced by frequency of recurrence, exhibit an increase in proportion to the length of time during which the disease had existed.

2. That the severity of the seizure—drawing the easily-recognised line of distinction between "le haut" and "le petit mal,"—is, again, involved in the element of duration; for attacks of "le petit mal" are more common when those of "le haut mal" are frequent than when the latter are rare; whereas the duration of the disease, *per se*, does not appear to necessitate either the presence or absence of epilepsia mitior.

3. That, as to the influence of age, the question has been already examined in regard of mind; and the effect, if any, would be such as to be overborne by the differences of duration.

We may, therefore, assume that if the morbid phenomena existing in the interparoxysmal period are related as "consequences" to either the general condition of the epileptic, or to the recurrence of his fits, they will exist, as a rule, in intensity and frequency proportionate to the time during which the disease has lasted; and we may, moreover, ascertain the existence or non-existence of this proportion by arranging the cases in groups, according to the time during which their disease has lasted, and determining for each individual his or her position in each of the three departments of vitality—mental, motor, and organic:—

Duration.	Classes of males. Mental.	Motor.	Organic.	Number of males.	Classes of females. Mental.	Motor.	Organic.	Number of females.	Both sexes.
Under one year ...	1	4	2	6	1	2	2	1	7
	2	3	2		0	0	0		
	1	2	4		0	0	0		
	1	2	2		0	0	0		
	1	1	2		0	0	0		
	1	1	1		0	0	0		
From 1 to 2 years	2	2	1	4	2	2	2	2	6
	1	3	2		1	3	2		
	1	2	2		0	0	0		
	1	3	1		0	0	0		
,, 2 ,, 3 ,,	1	4	1	2	1	2	1	2	4
	2	3	1		2	1	1		
,, 3 ,, 4 ,,	4	1	1	4	2	1	1	2	6
	1	3	3		1	1	2		
	1	2	1		0	0	0		
	2	2	1		0	0	0		
,, 4 ,, 5 ,,	3	2	1	1	4	1	2	4	5
	0	0	0		4	2	1		
	0	0	0		1	2	2		
	0	0	0		2	2	1		
,, 5 ,, 7 ,,	3	3	3	4	2	3	2	1	5
	2	2	1		0	0	0		
	1	1	1		0	0	0		
	2	2	3		0	0	0		
,, 7 ,, 10 ,,	0	0	0	0	3	1	1	5	5
	0	0	0		4	2	2		
	0	0	0		1	2	1		
	0	0	0		3	2	2		
	0	0	0		4	2	1		
,, 10 ,, 14 ,,	1	3	3	4	1	2	2	2	6
	3	1	2		2	1	1		
	3	2	1		0	0	0		
	1	1	1		0	0	0		
,, 14 ,, 20 ,,	1	1	1	4	4	1	1	1	5
	1	2	1		0	0	0		
	2	4	1		0	0	0		
	4	2	1		0	0	0		
,, 20 ,, 25 ,,	0	0	0	0	3	1	3	2	2
	0	0	0		2	3	1		
,, 30 ,, 40 ,,	2	4	3	1	1	1	1	1	2
				30				23	53

From this table it is evident that no one of the conditions —mental, motorial, or general—necessarily requires length of time for its production; and, further, that no one of them is necessarily induced by prolonged duration; for we see, on the one hand, the fourth degree of impairment noted as occurring with a short duration; and, on the other, the persistence of perfect health after epilepsy has existed for thirty or forty years.

But the influence of time, if any, may be more fairly estimated if for each group (in regard of duration) we take the mean class-position in regard of mental, motorial, and general health:—

Duration.	Number of individuals, male and female.		Mean position in classes. Mental.		Motorial.		Organic.	
Under 1 year ...	... 7		1·1		2·2		2·2	
From 1 to 2 years	... 6	17	1·3	1·3	2·4	2·5	1·6	1·6
,, 2 ,, 3 ,,	... 4		1·5		2·5		1·0	
,, 3 ,, 4 ,,	... 6		1·8		1·6		1·5	
,, 4 ,, 5 ,,	... 5	16	2·1	2·6	1·8	1·8	1·6	1·4
,, 5 ,, 7 ,,	... 5		2·0		2·2		2·0	
,, 7 ,, 10 ,,	... 5		3·0		1·8		1·4	
,, 10 ,, 14 ,,	... 6	16	2·4	1·8	1·8	1·6	1·3	1·6
,, 14 ,, 20 ,,	... 5		2·4		2·0		1·0	
,, 20 ,, 25 ,,	... 2		2·5		2·0		2·0	
,, 30 ,, 40 ,,	... 2	4	2	1·5	2·2	2·5	2·0	2·0

In the above table the following facts are exhibited:—That, for example, the seven individuals whose epilepsy had existed for less than one year, were so conditioned in regard of their mental capacities that the mean deviation of the seven from intellectual integrity can be represented by one-tenth; whereas of those five in whom the disease had existed from seven to ten years, the degree of mental deterioration should be represented by two. This is so because those who were placed in the first class in any of the particulars—mental, motorial, organic,—exhibited no deviation from perfect health: the numbers, or fractional numbers above one, therefore, indicate the degree of deterioration.

This table is also condensed, for the purpose of rendering more perspicuous some of its contents. Thus, the mean class-position, in regard of mind, of seventeen individuals whose epilepsy had existed for less than three years, was 1·3; whilst that of sixteen, in whom it had lasted from three to seven years, was 2·1.

The general conclusion to which, I think, we must arrive from this table is that the duration of epilepsy exerts a slight and only doubtful influence upon the patient; in other words, that the deterioration of health—mental, motor, or general—is as likely to occur in an individual just affected with the disease, as it is in one who has been the subject of that malady for many years.

Dividing patients into four classes—gradating from perfect integrity of mind, motion, and physical health, to the state of impairment in all of the three principal directions in which either one of these vital capacities may become deteriorated,—and representing the degree of impairment by numbers ranging from one to four, the introduction of the element of duration of the malady affects these numbers to so slight an extent, and in so capricious a manner, that no general principle can be evolved; and we must admit that the element of time is without demonstrable influence. In regard of mind, it is true that there is a progressive injury effected up to the fifth year: but that this is accidental only is, I think, the only warrantable conclusion from the subsequent results; such, for instance, as the 3·0, given by a duration of from 7 to 10 years; 1·8, of from 10 to 14; and 1·5, of from 30 to 40. This conclusion, moreover, is confirmed by the other mode of examining the question, for which the reader is referred to page 172. In regard of motility and organic health, there is nothing, either constant or notable, which can be considered as a demonstrable consequence of epilepsy. There are deviations from health, but these are affected to so slight a degree, and in such a capricious manner by the element of time, that, whatever may be their relation to epilepsy, we are not warranted in regarding them as its consequences.

The trivial and uncertain influence of duration in the production of the several conditions referred to is further shown,

and that to the most marked degree, by adding together the three mean class-position numbers of each group, subtracting therefrom the number three, which represents health, and so arriving at a number which illustrates the whole amount and degree of deviation from health. Thus, in the first group, the numbers are, mental, 1·1; motorial, 2·2; organic, 2·2; making together 5·5;—but as the number 3 would be that which indicated health, this would be subtracted from 5·5, leaving 2·5, which is approximatively the degree of deterioration from perfect health, of body and mind.

In the following table the several groups, according to the duration of disease, have affixed to them the sum of the means of their triple class-positions; and also, in another column, the degree in which each deviated from entire health:—

Duration.	Number of individuals.		Sum of means of class-position.		Degree of deviation from health.	
Under 1 year	7		5·5		2·5	
From 1 to 2 years ...	6	17	5·4	5·3	2·4	2·3
,, 2 ,, 3 ,, ...	4		5·0		2·0	
,, 3 ,, 4 ,, ...	6		4·9		1·9	
,, 4 ,, 5 ,, ...	5	16	5·8	5·6	2·8	2·6
,, 5 ,, 7 ,, ...	5		6·2		3·2	
,, 7 ,, 10 ,, ...	5		6·2		3·2	
,, 10 ,, 14 ,, ...	6	16	5·0	5·5	2·0	2·5
,, 14 ,, 20 ,, ...	5		5·4		2·4	
,, 20 ,, 25 ,, ...	2	4	6·5	5·7	3·5	2·7
,, 30 ,, 40 ,, ...	2		5·0		2·0	

From this table we learn that, if all the possible deviations from a healthy standard are represented by 9, and various degrees of deviation are registered by numbers ranging from 1 to 9; or, in other words, that if individuals are examined in regard of nine different particulars in which their health may become impaired, and the number of modes in which such impairment takes place is represented by figures from 1 to 9 inclusive, so trifling is the influence of time in the production of these different degrees of impairment, that there is but the

difference of 4-10ths to be observed between the mean condition of seventeen individuals whose epilepsy had existed for less than three years, and the mean condition of four individuals in whom the disease had existed twenty, thirty, and forty years.

This element of duration, therefore, being thus shown to be of no effect in the production of any one or all of the morbid phenomena observed during the interparoxysmal period, we must, for the reasons already assigned, regard those phenomena as standing in some other relation to epilepsy than that of "consequence;" and our general conclusion is, that epilepsy does not produce, *i. e.*, that it, *per se*, does not cause failure of memory, of apprehension, or of ideation, tremor, clonic spasm, or tonic, loss of nutrition, temperature, or strength.

This has been believed before, but it has been regarded as exceptional. Dr. Bright says, "In a few cases but little permanent effect has been produced either on the mind or the body by repeated paroxysms, but these are fortunate exceptions:"* and this would, I think, be the opinion of the majority. What I have endeavoured to show is, that in simple epilepsy the rule is what the exception was regarded to be. That this difference of result should be arrived at is matter for no surprise, when we observe the heterogeneous character of the cases denominated epilepsy. For example, those just referred to, recorded as they are, with wonderful power by Dr. Bright,† are twenty-two in number. Of these, however, but five are examples of simple epilepsy. In four there was congestion of the brain as a notable phenomenon; in five some distinct cerebral lesion; in three tumour in the encephelon; in three morbus Brightii; in two eccentric convulsions and hysteria.

V. The Complications of Epilepsy.

It is not my intention to describe the numberless evils of all kinds to which the epileptic is, in common with humanity generally, exposed, and from which he, more or less frequently, suffers; but to limit the observations I have to make in this

* Reports of Medical Cases, Vol. X., p. 513. † *Ibid.*

section to those conditions which may be held to depend, more or less directly, upon the attacks.

Reasons have already been given for doubting the existence of any necessary "consequences" of the malady, but there may be and are occasional or accidental complications of the disease, requiring, probably, for their production some special predisposing conditions; but, such conditions being present, having for their immediate cause the convulsive paroxysm.

The complications referred to exist in either intellectual, animal, or vegetable life, and may, therefore, be grouped into three classes—mental, sensori-motor, and organic.

A. COMPLICATIONS, SPECIALLY "NERVOUS" IN THEIR CHARACTER.

Besides the failure of intellect which has been already shown to be frequently associated with epilepsy, there are special conditions of disturbance to be met with in some individuals; these conditions occurring in more or less definite relation to the attacks. Thus, mania not unfrequently complicates the affection of the epileptic; and epileptic mania has a character of its own.

Epileptic Mania.—In the sixty-nine cases which have been analysed in this treatise, some attack or attacks of mania occurred in seven individuals, or in 10 per cent., viz., four males and three females. In one of the cases the mental disturbance was extremely trifling in degree; in another it occurred but once; in a third it was extremely rare; in the remaining four cases maniacal excitement was more or less frequently found in immediate relation with the attacks.

M. Esquirol states that "La fureur des épileptiques éclate après les accès, rarement avant; elle est dangereuse, elle est aveugle, et en quelque sorte automatique; rien ne peut la dompter, ni l'appareil de la force, ni l'ascendant moral qui réussissent si bien à l'égard des autres maniaques furieux."*

According to Delasiauve, Morel, and other authors, the mania of epilepsy is usually "furious" in its character; but this is by no means universally the case. Delasiauve describes very

* Des Maladies Mentales, Tome I., p. 286.

accurately an ecstatic form of mania, in which the patient assumes attitudes, "son regard est fixé, immobile, il paraît en proie à une vision intérieure; articule des mots vagues et confus. Si on le questionne, il reste muet ou ne répond que par des phrases décousues, des gestes ridicules, ou des mots trahissant de grotesques préoccupations."* This form of mania is illustrated in the following case:—

CASE VII. M. N.—*Female: No hereditary predisposition to epilepsy; convulsions in infancy; epileptic attacks commencing at æt. 17; occurring only at night, and always beginning in right hand, upon back of which is congenital vascular enlargement; period of recurrence irregular, unconnected with menstruation. Mental condition much impaired; peculiar maniacal attack; recovery from this; gradual deterioration.*

§ I. Female, æt. 18.

§ II. A. Daughter of persons in easy circumstances.

D. No hereditary predisposition.

§ III. B. When weaned was taken in convulsions; during dentition, "for a fortnight was insensible, and had convulsions during the whole time." No subsequent attack until seventeen years of age, when a convulsion occurred during sleep, two nights after she had been told of the death of her aunt. Since that time the fits have recurred at irregular intervals; sometimes she passes one, two, or three weeks without them. When they occur there are often three in the night, and they never take place during the day. They have no relation to the catamenia.

Attacks.—These come on when she is in sound sleep, and breathing gently; the right hand begins to shake; she rises up, and has sometimes said that "she feels as if something was breaking in the hand." If the hand is immediately seized and held, nothing more occurs; if not she falls back, and becomes insensible, all the limbs shake, the face becomes blue, then red, then white; she is convulsed for a few minutes, and then falls into a sleep without stertor for a quarter or half an hour. Her memory has failed gradually from the first attack.

* Traité de l'Épilepsie. p. 150.

May 17*th*, 1854.—§ IV. A. Muscular power good, aspect stupid, skin sallow, eyes prominent, pupils large; makes no complaint.

B. On the back of the right hand and wrist is a soft vascular swelling, which has existed from birth, and in which the breaking sensation is said to exist. Feet cold; there are little pimples on the face.

D. Digestion and bowels regular.

E. Respiration 20; tongue white and furred.

F. Pulse feeble, 80.

I. Is "regular" now, but was not so for some months.

K. She is irritable in temper, deficient in memory, and dull of apprehension; but is fond of reading, of society, of "excitement," although she suffers after exposure to the latter from numerous attacks. No tremor; no spasm, either tonic or clonic.

§ V. A. To avoid excitement of all kinds; to sleep with the head well raised.

E. Take a simple saline aperient every night.

June 6*th*.—§ III. C. Attacks since last report. May 20th, one at 7 a.m., lasting ten minutes; June 2nd, one at 6.30 a.m., the same duration; June 4th, one at 4 a.m., same duration; June 5th, three in the night. During these fits the face was quite blue, and the neck looked swollen, and she had the same sensation in the hand. The hand has sometimes shaken during the day, but there has been no fit.

§ IV. A. Same as last report.

K. Complains of headache.

§ V. E. ℞ Zinci oxydi gr. v.
Extracti hyoscyami gr. i. ft. pilula ter die sumenda.

December 15*th*.—§ III. C. Since the last report fits have recurred at uncertain intervals. There has been some slight, but no marked improvement; still she has "gone on well" until last night. Her parents took her to a ball, at which she danced, though not excessively, till between two and three o'clock in the morning. She came home rather "excited," but slept fairly, and in the morning upon awaking appeared hysterical, that is, she laughed and cried, and tossed herself about, but did not lose consciousness, or change colour.

§ IV. K. 10 A.M.—She is pacing the room with great excitement of manner, answering every one rudely or not at all. Sometimes she walks backwards and forwards with great rapidity, at others she stands statue-like for several minutes; occasionally she makes dancing movements with consummate coquettishness; and smiles, as if at the appreciation of her own charms. She does not refuse to do what she is told, unless it is that she should stand still: for instance, she drinks the medicine offered her; puts out her tongue, etc. She is evidently quite well aware that she is the object of attention; every now and then she repeats the same sentence an innumerable number of times. She appears to think something has been done to her father and mother, and continues saying, without any explanation, without any possibility of interruption, "Take it off their heads." There is no laughing nor crying; she stares fixedly, and sometimes makes peculiar, or oratoric movements with the hands. She says she has no pain, nor does she appear in any. There is no heat of head.

§ V. ℞. Liquor opii sedativ., ♏xx.
Spiritus ætheris nitrici, ♏xx.
Aquæ, f. ʒj. M. pro haustu statim sumendo.

This dose was repeated in an hour and a half, and soon afterwards she became quiet, and dozed a little during the afternoon.

Evening.—§ IV. K. A friend has called, and she has again become excited: she appears evidently under the delusion that her parents have been struck blind, through some fault of hers; she paces the room, repeating over and over again, "All open your eyes with me." Upon interrupting her, she screamed this out loudly, and cried. After some attempts to make her take medicine, which she refuses, she reiterates in the same manner, "We are not all blind." However, she is persuaded to take the following medicine:—

℞. Liquor. morphiæ hydrochloratis, f. ʒss.
Tincturæ Valerianæ comp., f. ʒj.
Infusi Valerianæ, f. ʒiss. M. ft. haustus statim sumendus.
Habeat hydrargyri chloridi, gr. v., hora somni.
Et haust. cathartici, f. ʒij., cras mane.

December 16th.—§ IV. A. Has slept for many hours; bowels

open; to-day dull and heavy, scarcely answering any questions, and says she is well, or has some headache.

This dull state continued for three or four days, when she became herself again; the fits returned as before, leaving her more stupid. She recommenced taking the oxide of zinc.

Jan. 26th, 1855.—§ III. C. The attacks have been rather less frequent, but after the occurrence of each she has been more dull and heavy than she used to be; her memory is worse after the fits than it was. Shaking of the hand has occurred frequently, and has been stopped by the mother. For a fortnight "she has been extremely well," but last evening, owing to some domestic disturbance, she began crying, and became very hysterical; had three slight fits, and one severe attack in the night.

§ IV. K. Appears excessively dull and stupid, stolid, obstinate, and sulky, dull of apprehension, answering few questions, and those only after a long interval. Since this note was taken this case has passed from my care, but its progress has been from bad to worse.

Besides the furious and ecstatic there are other kinds of maniacal attacks complicating epilepsy—attacks in which there is less mental disturbance, and from which the patients frequently recover. In these there is either dulness and depression of spirits, or, on the other hand, preternatural gaiety.

With regard to the relation of mania to the time of the recurrence of attacks, difference is to be found among authors. Esquirol, as I have already shown, was of opinion that mania rarely broke out before an attack, but that it commonly followed the paroxysm.* Delasiauve is, however, more probably correct in his statement that, "Tantôt la manie succède, plus ou moins immédiatement, aux mouvements convulsifs. Tantôt elle éclate entre deux paroxysmes; parfois aussi, l'agitation maniaque, loin de s'unir étroitement avec les paroxysmes, s'en tient assez eloignée pour en paraître indépendante." †

Again, authors disagree in regard of the period in a case at which mania most commonly occurs, some regarding it as an

* Loc. cit. † Traité de l'Épilepsie, p. 152.

early, and others as a late phenomenon; but it appears to me that no satisfactory evidence is furnished for the establishment of either one or the other position; and it is a well-known fact that epilepsy may be preceded by mania, and *vice versâ*. In an interesting case which came under my own notice, gradual derangement of mind was followed by the convulsions.

CASE VIII. O. P.—A single woman, engaged as a general servant, became strange in her manners; was the subject of sundry delusions of a somewhat amatory character; was occasionally heard talking to herself, and at other times crying or laughing, without any assignable cause: but her health generally appeared good; she made no complaints of pain; she attended to her duties regularly and efficiently. Her habits were temperate to abstemiousness, her moral character irreproachable. Her peculiarities of temperament and temper developed so gradually and insidiously that it was impossible to say at what period the first departure from health occurred; certainly the occasional peculiarities of this individual were matters of comment among some members of the family with whom she lived for five or six years before any particular attention was paid to her case; and the immediate cause of this attention was a somewhat violent epileptiform convulsion. Another attack followed within a week, and the mental disturbance increased and became persistent; the fits recurred frequently, and the mind alternated between mild delirium and drowsy imbecility. In this condition the poor creature lingered for between two and three years, when she died without having presented anything but gradual decay of both physical and mental energy.

In this case it was, of course, impossible to affirm that attacks of "le petit mal" had not occurred at an early period; but in the absence of all evidence to this effect, we have no right to make the assumption that they had. The symptoms in this case, moreover, were not those commonly observed when "hidden seizures" take place during the night. In the latter there is often muscular debility, depression of spirits, and headache,* none of which were prominent in the case referred to.

* Winslow, Obscure Diseases of the Brain and of the Mind, p. 479.

Meningitis in the course of Epilepsy.—The following is an interesting example of this complication:*—

Case IX.—*No hereditary predisposition; "le petit mal" since childhood; great failure of memory and intellectual power; at æt.* 28, *after a fall, suffered from headache, confusion, drowsiness, delusions, anorexia. Two days later violent epileptiform convulsions; recurring many times in the hour, for four days and three nights. Relief after cannabis Indica. Persistence of "le petit mal," with great physical strength, but impaired intellect.*

§ I. R. S. Male, Englishman, æt. 28. Height 6 feet 2 inches. Remarkably fine robust, athletic man, with great muscular strength; and before present illness, in apparently perfect physical health.

When quite a boy was often laughed at for what his brothers thought to be slowness and stupidity: he would do foolish things, and say them—but no attention was paid to this at the time: he was teased at school for it, and his companions tried to shake him out of it by joking, playing him tricks, and so on.

§ II. A. Parents both living now, and in good health when he was born. Has lived much in London, but also in various parts of England and Ireland; and has travelled considerably on the Continent of Europe, but never into tropical climates. Has been in the army since æt. 20, as cavalry officer. Has very good appetite, and lives well—but for the last two years has taken only two or three glasses of claret daily, or some of that mixture of cyder and soda water, called "cyder cup."

Six or seven years ago took very much wine, but was never known to be drunk, or even verging towards it. His father tells me that when he was twenty years of age he would frequently drink two or three bottles of wine, and afterwards walk into the drawing-room as "cool as a cucumber."

For the last four years has taken little, and for the last two has lived by rule as to diet and beverages.

He is a great bather, having 'a tub' of cold water, into which he jumps every morning, scrubbing himself with a nail-brush

* Read before the London Medical Society of Observation, and published with their sanction.

and soap all over, and finishing off with rough towels and horse-hair gloves.

Walks, rides, drives, plays rackets, bowls, cricket, and everything else for many hours in the day; but during the last eighteen months, though he has taken much walking and riding exercise, he has ceased to care for any games.

Until the last eighteen months has read much, studied "cavalry tactics" carefully, devoured novels plentifully, and has worked well at other things.

Has not habitually taken medicines of any kind, but for the last two or three years has been under various physicians, and has had every kind of drug usually given for epilepsy. He has been purged by some, given tonics by others; but has always found that purging made him worse.

Smokes about two cigars daily: years ago smoked more.

B. Infantile and adult health, with exception of present malady, remarkably good.

C. When first in the army was, as he says, "rackety," but never committed anything approaching to excesses in venereal performances; for last two years has not felt the least disposition to sexual intercourse.

D. Parents in good health. Has two brothers and two sisters living; has lost two brothers in consumption; and an elder brother, now living, is in advanced phthisis; one of his sisters also is extremely delicate; the other brother and sister are apparently well. The phthisical symptoms in the three brothers set in at from 24 to 28 years of age; and the elder brother, who now has cavities in the lungs, is æt. 34. None of his family have exhibited any symptoms of epilepsy, or insanity, or gout.

§ III. Cannot fix the time of first occurrence of present symptoms. They appear to have occurred when quite young; but no attention was paid to them until between three and four years ago.

A. Is unable to refer to any circumstances which can be regarded as prodromata of attacks. Three years ago had blow on the left eye, by racket ball, and pupil has been dilated since, and sight defective with that eye; but is quite sure that attacks occurred, very commonly, long before that circumstance, and that they were not worse immediately afterwards.

B. When quite young was noticed to be occasionally "absent," and to appear as if he did not hear or understand things that were said to him; but this was imagined to be merely a trick, and he was sometimes laughed at, and sometimes scolded for it. These little "absences" have gradually increased in frequency and severity, but at no one period have exhibited any considerable increase or alteration. For the last twelve months memory has failed much, and he has exhibited increasing indisposition to any mental exertion, or to any occupation of either mind or body, beyond that which is necessary in his military life.

§ IV. A. *August 1st*, 1857.—Nutrition extremely good; little fat, but muscles large and firm; integuments healthy-looking and tense. Strength very great. Walk steady. Height 6 feet 2 inches. Expression of countenance good-humoured, with occasional approach to imbecility when smiling. Skin of face much bronzed from exposure to sun, *e.g.*, only bronzed where uncovered; line of forehead above helmet, and of neck below collar, perfectly white. Complains of nothing except failure of memory and attacks.

B. Hair light brown, cut very short, and has only the most trifling and downy apology for moustache and whiskers. Nails thick, not incurvated, but irregular on surface, and considerably bitten.

D. Tongue pale, but not furred; papillæ small, but red; very careful in diet; bowels acting regularly; appetite extremely good; never troubled with anything that he could term indigestion.

E. Chest well formed; has not, and has never had, any cough, shortness of breath, or pain in chest.

F. No palpitation nor discomfort about the heart; no feeling of faintness nor oppression. Pulse small, but regular.

H. Urinary and genital organs give him no trouble whatever.

K. Head is narrow looking, and face large (but hair is cut preposterously short, and gives face this appearance, perhaps). Is not subject to cephalalgia, but states that he has "odd sensations" in his head, and can give me no further description of their nature or locality. No abnormal sensations in limbs or trunk.

The only alteration of motility that can be detected is slight

tremulousness of the hands, and perhaps rather more of the right than the left. He has never let objects fall out of hand, nor has he thrown them out involuntarily; no rigors; holds limbs out steadily.

He is subject to what is termed, by his friends and himself, "slight attacks," and they are of the following kind:—Sometimes merely a momentary oblivion, and nothing beyond that can be seen; *e. g.*, when speaking, he will stop for a second or two, and appear evidently "lost," his countenance losing all expression. At other times, his face turns pale, he smacks his lips two or three times, makes efforts at deglutition, turns his eyes about, the face flushes, and he goes on with what he was saying before. In other attacks there is, and has been for the last five or six months, some slight distortion of the countenance,—limited, however, to drawing down of the angles of the mouth. During all these attacks he is apparently quite unconscious, for a period lasting from one to thirty or forty seconds. He does not appear to hear what is said, or to feel what is done; nor does he afterwards remember anything that occurred—either internally (mentally), such as an idea, or feeling, or sensation; or externally, such as remarks of bystanders, or his own acts. He has never fallen down in these attacks, although they have occurred while standing; they often come on while on horseback, but he keeps his seat, and rides on without seeing where; if walking, he will continue walking, but perhaps will alter his direction after the first few seconds of attack. He has never bitten his tongue, nor has he ever had a severer attack than that described.

After the first period of the attack is over, viz. that described, he can answer questions, and often speaks quite rationally, but there is a strangeness in his manner for two or three minutes; and he almost universally forgets what has been said to him, or what he has done during those two or three minutes. His brother informs me that he has often made this observation,—that he has (after the period of unconsciousness is over, and the faculty of speech has returned) said something, and made the patient repeat it two or three times; but that, even then, all memory of it is lost after three or four minutes. Sometimes, during this period, he will do strange things, for *e. g*, walk

his horse straight into the middle of a ditch, and ride him down the stream; turn right round in the opposite direction from that in which he was walking or riding; set off at full gallop away from his troops; call out some wrong word of command; take off his coat, &c.: but he never remembers what he has done a few minutes afterwards.

Attacks of the kind described occur almost every day; sometimes two or three times in the day, at all hours, without any warning, except very occasionally a feeling of oppression in the head; which, however, does not occur immediately before the attack, but is only of such character that when he feels it he is almost sure to have two or three attacks during the day. He is unable to refer them to any "exciting causes;" his father and brothers are equally unable to detect any relation between them and any other circumstances; and they sometimes come without his knowing anything at all about them.

Mental condition.—Habitually he is indifferent to everything going on about him, except, as he says, his "soldiering, which he is fool enough to be fond of." He cares for no amusement whatever; and is aware of, and puzzled with, this change in himself. He sleeps well at night, occasionally dreaming about little trifles, however, that worry him, especially regimental matters. He often feels much bothered and worried during the day, because it is thought desirable for him to leave the army; and occasionally he becomes depressed and anxious, and wonders "what is to become of him." He employs himself much in making notes in a little pocket-book, putting down the days and hours of attacks; and keeping very accurate pecuniary accounts. He appears to understand fully and quickly everything that is said to him; but his memory is extremely defective, and becomes worse every week. He can answer questions asked him out of a book of "Cavalry Tactics," slowly, but correctly; and some of the answers he gave me were such as depended merely upon memory, and not upon any association of ideas that either he or I could trace, for *e. g.*, arbitrary numbers, odd sums of money allowed for forage, &c. &c.; and, curiously enough, several days after the first examination I gave him in his book, he told me the *questions* I had asked him, as well as the answers; whilst, on the other hand, he could not tell me the day of the

month; where he had dined the day before; how many days he had been in London; how long he had been quartered at Aldershot; where he had come from to Aldershot, &c. When asked simple things of this kind, he would reply, emphatically, "Upon my word, now, I can't remember," and would turn to his brother to help him. But even when reminded by his brother of something he had done or said the day before, he frequently was unable to reeall it. His memory of events long sinee passed appears also very defeetive; he eonfuses plaees and dates. There is no impairment of articulation, but oecasionally an excited and silly tone of voice.

M. Touch, smell, hearing, taste, and sight with right eye, present nothing abnormal. Left eye has mueh larger pupil than right, and ean only see very large print with it; *e.g.*, title line of *Medical Times and Gazette*.

§ V. A. To eommit to memory a few lines daily.

B. Diet as usual; three or four glasses of elaret daily.

E. ℞. Zinci oxydi, gr. ivss; extr. hyos., gr. ss.
Fiat pil. bis die sumenda.

§ III. C. During month of August had only eight attaeks; last on August 21st, and now,—

§ IV. *August* 31*st*.—K. Appears improved in readiness of memory, but is depressed in spirits, and worried about leaving regiment. Some occasional vertigo and nausea.

§ V. E. Omitt. hyos., ex pil.
Adde saponis Hisp. q. s., ut fiat pilula.

September 14*th*.—§ III. C. Cannot hear of having had any attacks, but believes he must have had two.

§ IV. K. Feels well. Memory is much better; all his friends tell him so.

October 15*th*.—§ III. C. During the month has had eight attacks, some rather more severe, aeeompanied by greater distortion of faee; but attaeks have been mueh less frequent, and memory improved.

November 8*th*.—§ III. C. Last week some rather bad attaeks, and memory worse again.

§ IV. K. Condition similar to first report.

§ V. E. Pergat.

December 10*th*.—§ III. C. Eight attacks sinee last report, at

irregular intervals, *e. g.*, on Nov. 9, 20, 21; Dec. 1, 2, 3, 7, 9. Attacks slighter; memory improved; and has been all this time watched closely by brother, who states that "improvement is considerable." Has been in the country, hunting three or four days in the week, and walking from ten to twenty miles a day.

§ IV. A. Looks in perfect health; appetite and sleep good.

F. Pulse regular, 60.

D. Bowels constipated; fæces hard.

K. Has no headache nor nausea, but complains of feeling "bilious;" but this he describes as consisting in a greasy feeling in his mouth, with "something queer in his head," he "can't say what."

§ V. E. Pt. c. zinci oxyd.
℞. Pil. al. c. sapone, gr. iv.
Extr. conii, gr. j.
M. Pro pil. h. s. p. r. n. s.

January 2nd, 1858.—§ VI. A. During last ten days of December, 1857, attacks more frequent, four in the day. Had a fall when out hunting, his horse blundering over a fence. He did not appear at all hurt, but jumped up immediately, ran after and caught his horse, and went on again. This was on December 28th; and on 29th and 30th he was in low spirits and confused; and on the 31st very silent and moody, and went out in the evening, and bought a number of things that he did not want.

B. During the night of December 31st and January 1st he fell out of bed, and was found lying on the floor with his head on a pillow, which he had apparently dragged under him, and some clothes from the bed were also covering him. He had broken the head-piece of the bed, which was iron, but not very strong. A friend staying in the house heard him fall, and heard him afterwards moaning, and went to him; but he could give no account of how he had got there; appeared quite rational; complained of pain in his head, through the right temple, and also of exhaustion. It was thought by his brother and friend, and also by himself, that he must have leaned out of bed to reach the chamber utensil, and while in that position have had an attack, and fallen over: and that which warranted this supposition (although he could not remember having leaned out of bed for the purpose) was that the utensil was broken.

C. On the morning of January 1st he did not seem disposed to rise, but he talked for some time quite rationally to his brother. As, however, the latter was about to leave him, he turned suddenly round and inquired, "But, ——! when is it that I am going to be killed?" Upon his brother telling him that this was not the case, he launched out in an excited manner, "Then, am I to live all over again? Go to Eton again? Capital! Capital! Lick old —— again!" His brother tried to calm him, and after a little time he said, "I have been dreaming. It was a most extraordinary dream. I was to be killed, and live all over again, with all my sins forgiven; but it was a dream." He seemed quite like himself after this, but complained of violent pain through the temples, especially the right. In the evening he felt better, and was in good spirits, a medical attendant having given him a dose of blue pill and colocynth.

This morning he felt so much better that he wanted to get up; but finding that trying to do so gave him pain in the head, he kept in bed.

He has had no disposition for food, but neither has he thirst; and during the day he has slept much.

§ IV. 7 o'clock, P.M. D. Tongue slightly furred; no sickness.

F. Pulse small; "not frequent."

H. No tenderness in renal regions; no albumen in the urine.

K. No marked heat of head, but complains of very bad pain in right temporal region; no abnormal sensations in limbs; no vertigo; no nausea; tip of tongue deviates slightly but constantly to the right; no distortion of features; motility of arms and legs equal on two sides; appears sleepy and dull, yawns frequently, and speaks in mournful tone of voice, but quite rationally.

M. He evidently avoids the light, hiding his head under the bed-clothes and turning his back to the window. The pupil of the right eye is very small, and contracts no further upon exposure to light after being covered; neither does it dilate when light shaded from it. Pupil of left eye large, and insensible as usual. He complains of singing in the ears.

§ V. E. ℞. Tinct. hyoscyami, ɱx.
Potassæ bicarb., gr. x.
Aquæ f. ʒi. M. pro haustu 6tis horis sumendo.

January 3rd.—§ III. C. Has slept all through the night without disturbance, and now, 10 A.M., is

§ IV. K. Very heavy and drowsy, scarcely answering questions, and turning from person addressing him as if unwilling to be disturbed. This is not from not having thoroughly waked from a night's rest, for he has sat up in bed and shaved himself half an hour ago. He turns away from the window; says he has pain in his head, but especially in the right temple and round the right eye. There is marked heat of head.

§ V. D. Ice to the head.

Pt. c. haust. salin.

January 5th.—Report is made fifty-four hours after last; but symptoms described under § III. are on the authority of Dr. Caparn, of Banbury, who was in constant attendance.

§ III. C. About an hour after last report had violent epileptiform seizure, distortion of face, general convulsion, arrested respiration, followed by gurgling of throat and great oppression of sensorium. Fits recurred throughout the whole day; the longest interval between them during day was two hours; in night four hours. In intervals he complained much of pain in head, but it was relieved by ice.

Throughout the whole of January 4th the fits were very numerous, becoming aggravated in force and duration, and the impediment to respiration being such that Dr. Caparn said it seemed to "threaten death by asphyxia."

Between the fits the mind was much obscured, and it was with great difficulty that any answers could be obtained; but patient frequently groaned with pain in the head. During the night the attacks were very numerous, and on the morning of this day he has had them still more rapidly,—three, four, five, and six in the hour.

This morning the head was shaved at the vertex, and a blister applied.

Hyd. chlor., gr. ij., were given every third hour.

4 P.M. — § IV. A. Sitting, propped up in bed, looking stupid and drowsy.

K. If left to himself, falling asleep. He still complains of pain in head, and appears to feel blister, for he puts his hand to it often, and moans; recognised me at once, and pronounced my name; had very numerous attacks while under observation; and of the following general description:—Lying asleep, he opens his eyes, turns his head to the right side, then to the left, moves the eyes upwards and downwards, and from side to side, as if looking about him, then the eyes gaze fixedly to the left and upwards—the right pupil contracting. The right sterno-mastoid muscle becomes very prominent, and the head turns violently round to the left; respiration ceases, but the mouth is open, and drawn downwards and outwards to the left. During this period there is neither suffusion nor paleness of the face; the limbs and trunk are rigid, the spasm being tonic, but flexors gradually overcoming the extensors, and the tendency of neck and of trunk being towards left side. During the spasm the radial pulse cannot be felt, but this is most evidently from the rigidity and prominence of the tendons; time after time the fits came on while my finger was on the pulse, or while my ear was over the heart; and up to the moment that the spasm was so strong that neither pulse could be felt, nor sound distinguished from the general muscular bruit, the pulsations were as strong and frequent as in the intervals.

The tonic spasm relaxing, the pupil dilates; the head comes round to the middle line, the limbs are clonically convulsed, inspiration occurs; suffusion and darkness of the face, champing of the jaws, violent respiratory movements and palpitation of the heart. Again and again I observed this sequence of events, the suffusion of the face being positively delayed until respiratory movements had returned, and increasing afterwards; but being absolutely imperceptible during the arrest of respiration at the commencement of the fits. The tongue was not once bitten in these attacks, although champing of the jaws was considerable. After the clonic contractions have lasted for a variable time, they assume something more of a voluntary appearance; the patient moans, turns round in bed, puts his hand to head. The depressor anguli oris is on the right side singularly convulsed as the attacks are subsiding, and subsequently to this the respiration is impeded for many minutes,

and rendered extremely laborious by contraction of the orbic. oris. This, however, can be easily relieved by drawing down the lower lip. The stertor, which was extreme after some of the attacks, could be often perfectly removed by lifting the head forwards. During the attacks flatus and fæces frequently passed from the bowels; urine and semen from the urethra, with partial erection. Pulse and respiration vary very much in the intervals of attack, *e. g.*, pulse in four successive quarters of minute = 22 : 27 : 18 : 22. It never intermits, and is always full and strong. Respiration sometimes 12 in minute, and pretty regular; but soon after an attack it is of the following kind, two or three respirations in as many seconds; then a pause for 12″ or 13″, then two or three respirations rapidly, and again a pause for 15″ and even 20″. Some little time after attacks respiration becomes more regular, and ratio to pulse varies from 1 : 5·5 to 1 : 4; but being generally 1 : 5.

§ V. C. Hirudines vj. temp. dext.

Chloroform was given several times during day, but it appeared to exert no influence upon either frequency or severity of convulsions.

11 P.M.—§ IV. K. Pain relieved by leeches, but attacks as frequent and violent as before. Has not spoken for several hours.

§ V. E. Habeat statim, pulv. ipecac., gr. xx.; ant. tart., gr. j.

January 6th (*between* 12 *and* 2 A.M.).—§ III. C. Emetic acted freely; pulse reduced in force, skin became moist: but fits followed, though not quite so violent as before.

§ IV. K. Between 12 and 2 had several most severe attacks, followed by violent perspiration of head and neck, great suffusion of face, persisting after attack. While attacks, were apparently passing off, great rigidity was observed in neck and trunk, and limbs extended forcibly; several times afterwards complete opisthotonos; then, in intervals of attacks violent jerkings of the legs, with occasional automatic movements of arms as if "boxing;" snorting and moaning; pupils same as before.

After fit at 2 A.M., slept until 6·50, when awoke; took beef-

tea; said pain was a "wee bit better;" and put out tongue when asked.

From 6 to 8 A.M., several convulsions more violent than ever; complete opisthotonos; skin generally hot; head very hot, and face suffused; pulse, in intervals of attack, averaging 80, and extremely resistant; rose during and after attacks to 120 and 130. Respiratory snorting for a long time after attacks, and pupils dilated for some time after attack passed over.

§ V. D. Ice to head; more hair to be removed.

E. Pt. hyd. chlor.
Ext. cannabis Ind., gr. $\frac{1}{3}$, 3tia q. q. hora.

§ III. C. Had can. Ind., $\frac{1}{3}$ gr., at 10 A.M.; a second dose at 1 P.M., and since that attacks have been less violent. Brother thinks they have been frequently kept off by putting ammonia ("Preston salts") to nose, the moment that peculiar roll of the eyes began. Several times this was tried by myself, and certainly it appeared that the ammonia delayed the fit.

§ IV. 6 P.M.—F. Pulse reduced in force.

K. Has not had an attack for three hours; recognises me at once, and speaks readily but indistinctly; appears drowsy. While under observation attack came on; there was no failure of pulse at wrist before or at commencement; but during spasm of arm-muscles pulse cannot be felt. Attack not so severe as before; convulsive movements are less violent; there is less congestion of face, and he appears to recover consciousness more quickly.

§ V. Pt. hyd. chlor.
Habeat statim, ext. can. Ind., gr. $\frac{1}{3}$.

§ IV. 8 P.M.—K. Two fits; the first very slight, the second, following it immediately, very violent.

12, *Midnight.*—No fit for four hours. Has been and is lying asleep: but woke up while under observation, looked round and laughed and talked, with the aspect of a man half intoxicated; said he felt "very well," and would take some beef-tea. Soon after doing so had two attacks, one following the other very rapidly, but neither was severe.

January 7th, 2 A.M.—§ IV. K. Two epileptiform attacks, after which sleep.

7 A.M.—§ III. Has slept tranquilly since 2 o'clock; no fit.

§ IV. A. Slight diaphoresis; skin warm.

D. Has taken liquid nourishment; bowels have moved twice.

F. Pulse 75 to 80; strong and regular.

K. No heat of head. When blind of window drawn up, he looks towards window and smiles. Turns his head round, and puts out tongue when asked; says he is in no pain.

§ V. Pt. cannab. c. cal.

Last dose of cannabis taken at 8 P.M., January 7th. Pulse after this becoming feeble.

Subsequent history communicated by Dr. Caparn.

January 8th.—§ IV. D. Takes food well. Tongue brown, but moist.

F. Pulse 65.

K. No fit; no pain; much of his time appears only semi-conscious; at other times talks and laughs and seems quite himself.

§ V. E. Hyd. c. cretâ, gr. j., bis die.

January 18*th*.—IV. D. Tongue cleaning and moist; edges and lips natural.

F. Pulse 65 to 70.

K. Able to converse on any subject, but at times dreamy, and talks of regimental duties. No headache; gets out of bed; stands quite firmly.

§ V. E. Pt. hyd. c. cretâ.

The mercurial was continued two or three days, and then given up, as the general health appeared perfectly restored; but now the old form of slight attack has returned with about the same frequency as before the illness described.

March 15*th*.—§ IV. A. Aspect that of perfect health.

K. Slight attacks occur at irregular intervals; memory is extremely defective, but not distinctly worse than in August last.

§ V. E. Zinci phosph., gr. v., ter quotidie.

April 13*th*.—§ III. Has had slight attacks almost daily, often soon after meals.

§ IV. A. Looks in robust health, and says he feels quite well.

K. Memory as before; no other change.

There is nothing special in the character of meningitis as an intercurrent affection; it runs its course as it might do in a healthy subject; but it is, so far as my own experience extends, of less serious importance than the meningitis of a non-epileptic individual. It has occurred to me to see developed in several epileptics a series of symptoms of which I can conceive no other diagnosis possible than that of meningitis, and yet in all but one case recovery took place. The attack of inflammation had been apparently determined in one case by a blow or a fall, and in another by a long succession of the ordinary attacks; but in other cases it has been impossible to say what was the exciting cause.

M. Delasiauve speaks of this complication under the name of "congestion méningitique," and says, "il n'est pas extraordinaire que, dans un espace plus ou moins court, et contre toute espérance, pour ainsi dire, les accidents cèdent d'eux-mêmes ou à un traitement approprié."*

Sometimes, as the same author has stated, the symptoms are continuous; sometimes there are more or less prolonged intermissions; and in one case under my own care, which at length terminated fatally, the meningitic phenomena recurred at intervals for nearly three years. In this case a *post-mortem* examination was not allowed.

Apoplexy is one of the events which is frequently dreaded by epileptics and their friends; but although the epileptic convulsion is not rarely followed by profound coma, and a general appearance of apoplexy—using that term in a symptomatic sense,—it is exceedingly rare to find that actual cerebral hæmorrhage has occurred. No single instance of such an occurrence has presented itself in my own experience.

Idiotcy is complicated with epilepsy, or epileptiform convulsions in a very large number of its cases; but the records which I have seen of the relations of these two maladies are not sufficiently explicit to enable me to trace their character. Represented by numbers the following may suffice. Of 574 idiotic persons examined by Dr. S. G. Howe, 125 were "subject

* Traité de l'Épilepsie, p. 145.

to fits;" and in 92 of these the idiotcy was "congenital," whereas in 33 it was not.*

Convulsions, not epileptic in their character, may sometimes occur in the person of an epileptic, as, for example, puerperal convulsions. It is somewhat singular, however, that such a complication is by no means common. Dr. Tyler Smith states that puerperal convulsions occurred only twice in fifty-three deliveries of fifteen epileptic women.† I have notes of only four cases of women who were epileptic, and still bearing children; and it so happens that in no one of these did the attacks occur at, or about the time of parturition. In three of these cases fits took place during pregnancy, and in two of these they were more frequent in that condition than they were at other times.

An opinion contrary to these facts has been held, and has found expression in the works of the older writers, as, for example, in that of David Millar, who says, "Fœminæ multæ gravidæ, præcipueque circa pariendi tempus, hoc affectu corripiuntur."‡

Infantile Convulsions, however, had occurred in the half of twenty-eight cases, with regard to which I obtained special information on this question. Thus—

	Males.	Females.	Both sexes.
Convulsions in infancy were absent in	9	5	14
,, ,, present in	8	6	14
	17	11	28

From this it appears that, taking the two sexes together, convulsions have existed during the infancy of but one half of the epilepties. In the other half, therefore, we must assume either that the epileptic tendency did not exist during infancy, or that it is different in character from that which underlies or precedes the development of convulsions. The fact that convulsions have occurred in so large a proportion as one half of the epilepties must not be allowed to mislead to the conclusion that there is any strong alliance between these two maladies; for, as is well known, infantile convulsions occur in a large

* On the Causes of Idiotcy, p. 56.

† *Lancet*, 1849, p. 644, Vol. XXIV.

‡ Dissertatio Medica inauguralis de Epilepsia, 1763, p. 4.

number of non-epileptic individuals,* and the pathological and prognostic value of a fit during the first dentition is small compared with that of its occurrence at a later period.

It may be seen from the twenty-eight cases referred to above, that epileptic women have more frequently suffered infantile convulsions than have those of the other sex. Rather more than the half of the female sex, and rather less than the half of the opposite sex, have exhibited this phenomenon. It must, however, be remembered that the female sex generally, *i. e.*, independently of epilepsy, is more prone to early convulsions than is the male. On this point, however, too much importance should not rest, for MM. Barthez and Rilliet found, contrary to the general persuasion, that the sexual predisposition was in the other direction,—at all events in regard of "sympathetic" and "symptomatic" convulsions.†

Paralysis, like apoplexy, is another nervous phenomenon constantly haunting the minds of some epileptics and their friends. It is stated in many books as one of the consequences to be anticipated and feared; and perhaps if by epilepsy is intended every form of disease that may be accompanied by convulsion, there is some ground for the apprehension; for tumour of the brain and chronic softening are frequently productive of paralysis. But in simple or true epilepsy this symptom is singularly rare, and of such apparently accidental origin when it does occur, that there appears to me no more reason for associating paralysis with epilepsy, than there is for associating with that disease either bronchitis, cancer, or corns. The epileptic may become paralytic, or he may "take a cold," but there is no evidence that, in the large majority of cases, the epilepsy has anything to do with either the paralysis or the catarrh. If a man's fit throws him into the water, epilepsy may indirectly induce bronchitis; if it throws his head with violence upon the curb-stone, epilepsy may secondarily bring about paralysis, through hæmorrhage; but the character of the relation between epilepsy and these maladies is accidental and not essential.

* On the frequency of convulsions in early life, see West's Lectures on Diseases of Infancy and Childhood, p. 17.

† Traité des Maladies des Enfants, Tome II., p. 278.

In eighty-one cases of epilepsy of which I have preserved notes, I find paralysis recorded but three times, and in one of these it was only doubtful and occasional. A youth, fourteen years of age, was seized with his first attack after receiving a violent blow upon the head. When nineteen years of age he was under my observation, and was at that time suffering attacks of "le petit mal" very frequently, and of the severer form once in the fortnight. During the interparoxysmal period he complained of headache, recurring every two or three days. His legs were weak, and occasionally "doubled up under him," so that he fell; but he had no persistent paralysis.

In three women loss of power was noted, and some of the particulars of their cases are worthy of record. One, aged 25, had been epileptic for five years. The onset of her attacks was dated from rheumatic fever. She suffered from both "le haut" and "le petit mal;" she was "very stupid" after her fits, and during the interparoxysmal period was so much damaged in intellect that she was placed in the fourth class. Her right hand and foot were constantly flexed and rigid, and in them she suffered also from painful tonic spasm. The time during which this condition had lasted could not be learned with certainty, but it was probable that it had existed from the first. Here, then, was a case, the doubt with regard to which was whether it should be called epilepsy at all; but, taking all circumstances into consideration, I concluded that such was its real character. Of the paralysis, however, it was more probable that the cause was either rheumatism or cerebral hæmorrhage, occurring some years before the case came under my notice; and it was impossible to show that it had anything to do with the epilepsy.

A second case was that of a young woman æt. 23, who had been epileptic since fifteen years of age. No cause could be assigned for the first attack; she was in good health at the time of its occurrence, but it was immediately followed by paralysis, with contraction of the arm, forearm, and hand; and this condition has persisted now for eight years. Just before her attacks —of which she has two or three daily—there are painful "cramps" in the contracted arm; but she exhibits no clonic spasm. Here, again, although the immediate cause of the para-

lysis was, doubtless, the epileptic seizure, the rarity of such occurrence must show that the relation between them is only accidental.

In a third case, that of a woman epileptic for eleven years, there was some deficiency of power in the right hand and arm. The attacks were those of "le haut mal" only, and the paralysis was a very slightly-marked phenomenon.

Remembering that there were, of these eighty epilepties, seventy-six in whom no deficiency of power was discoverable, we must conclude, I think, that paralysis is a rare, and only accidental complication of the disease.

B. Complications of Epilepsy not having their Seat in the Nervous System.

There is nothing, that I am aware of, to prove that the epileptic is, by virtue of his disease, specially predisposed to any other malady; nor is there, on the other hand, evidence that he is thereby absolutely protected from its assault. Yet there are somewhat conflicting statements upon minor degrees of predisposition and protection. For example, Romberg says, "It appears that the susceptibility for epidemic and contagious diseases is diminished in epileptic patients. Esquirol, however, saw that these patients were not exempt from typhus, although their mortality was much less than that of other classes; he states that of fifty who were attacked, but a very small number died,—a fact previously observed by Greding. . . . Diseases occurring in an epileptic constitution, in the majority of instances, are less dangerous than they are under other circumstances; and this applies not alone to trismus, tympanitis, and ischury, but even to inflammations, hæmorrhages, &c."* On the other side, Dr. F. Hoffman states, "Dass die Epilepsie keinerlei Immunität gegen endemische Krankheiten bietet."† From my own cases I have no information to give upon this subject. It has occurred to me very rarely to attend a confirmed epileptic while suffering from any intercurrent affection; and, speaking from impression of this negative kind only, I should say that the victims of that disease

* Manual, Vol. II., p. 204.

† Aertzliche Nachrichten. Schmidt's Jahrbücher 1859, Bd. 103, p. 347.

are less liable than the healthy to other maladies. It has never happened to me to attend an epileptic through any such illness as pneumonia, acute rheumatism, or "fever;" it has been very rare for me to witness even a common catarrh, or anything morbid to which a definite name could be assigned.

The Heart.—It is not rare for epilepties to complain of some, more or less definite, discomfort about the heart. Others appear absolutely and constantly free from such annoyance. Of course cardiac disease may coexist with epilepsy, although the two occupy no causal relation to each other; but occasionally it would seem that the relation is not that of mere coincidence. Such malformations of heart as produce cyanosis are not rarely complicated by epilepsy or convulsions. Three of such cases have come under my own observation, and in two of them there was *post-mortem* examination of the body.

Case X.—A child, thirteen months of age. There had been frequent convulsions for six months, together with cyanosis. The latter was never observed until after the fits had commenced. The child died, exhausted by repeated convulsions. Upon examination the foramen ovale was found open; the aorta arose from the right ventricle, and the latter communicated with the left. The pulmonary artery had its origin in the right ventricle, but its orifice was extremely small. The ductus arteriosus was closed.*

Case XI.—A girl, æt. 11, when she came under my notice at the Hospital for Sick Children. When six weeks old she was allowed to fall by the nursemaid, and she "went black all over." Towards evening this colour disappeared; but the next morning, while washing her, her mother noticed its return, and with it "a fit." In the fits she lost her senses and was convulsed. After them she slept heavily. She was always dark in these attacks, and after they had recurred several times the dusky tint became habitual. Sometimes the tint was darker than at others. The fits ceased at nine years of age, so that she had not had any for two years when she first came under my notice.

Her colour was then a dusky-blue, observed on the face and

* This case is fully detailed in the Transactions of the Pathological Society of London, Vol. VIII., p. 123.

surface generally, the conjunctivæ, lips, and tongue. The finger-ends were clubbed, and very dark; arms and hands cold, but not very notably. She manages to do a little needlework, but cannot walk a hundred yards without dyspnœa and great fatigue.

Her chest and pulse were examined carefully upon several occasions; and the following notes, taken when first seen, after an interval of three months, and again after five weeks, represent the conditions discovered. On the second occasion she was "intensely blue," and with open mouth; on the third, "in colour, temperature, and sensation very much improved."

The pulse was soft, moderately full, regular in force and rhythm, and neither jerking nor bisferiens.

Pulse-respiration ratio.	Sounds.	First observation. 96 : 24 : : 4 : 1	Second observation. 104 : 24 : : 4·3 : 1	Third observation. 84 : 23 : : 3·6 : 1
Base of heart	1st.	Close, rough murmur.	Murmur.	Sharp, close, high-pitched, almost musical.
	2nd.	Dull and prolonged.	Prolonged.	Prolonged.
Aortic cartilage	1st.	Murmur not so rough, and shorter than at base.	Ditto.	Almost inaudible; no murmur.
	2nd.	Distinctly flapping.	Flapping, no murmur.	Prolonged; no murmur.
Pulm. cartilage	1st.	Same as aortic.	Murmur, higher in pitch than at base.	Murmur, open, less distinct, lower, and not musical.
	2nd.	Same as at base.	Distinct, prolonged.	Audible, but indistinctly.
Mitral apex	1st.	Rough murmur.	Murmur, higher in pitch than at base.	Same as at base, but less intense.
	2nd.	Clear, flapping not prolonged.	Indistinct.	
Tricuspid apex	1st.	Same as mitral.	Sharp, close murmur.	Same as at base, but less intense.
	2nd.	Flapping, but prolonged after.		
Maxim. intens. of murmur		Mid-sternum, level of nipple.		

The area of præcordial dulness was larger and lower than natural. At the back the sounds of the heart were heard distinctly, but without murmur. There was no thrill over the cardiac region. The subsequent history of this case I do not know.

A third example of cyanosis was seen by me only after death, when I learned the following facts from the parents and from my friend, Mr. William Adams, of Harrington-square, through whose kindness I was invited to the *post-mortem* examination.

Case XII.—M. F., æt. 15, has been epileptic for eight or nine years. One of her sisters "died of fits." For the last three years M. F.'s colour, during the attacks, has been very deep. Whenever she has been "excited," or has "gone out into the court and got chilled, she has turned blue all over," and this without having an attack. Her "breath has been panting," but she is not known to have complained of palpitation of the heart. As a rule, two or three convulsive paroxysms have occurred during the day.

At eight o'clock in the morning of October 5th, 1854, she had a fit, and was at first thought to be no worse than usual. She did not, however, recover so quickly; her father thought she was dying, and sent for Mr. Adams, who arrived in time to see her gasp two or three times, and die. The "whole surface of the body was remarkably livid."

Examination, thirty hours *post mortem;* weather damp and cold.—Face of bluish-red colour, ears deep scarlet. Body generally greyish-blue, very deep in some places. Large venous trunks stand out in high relief, appearing here and there almost black; these are seen on the trunk and limbs. On the thorax and cheeks are small ecchymoses, of dark venous tint. A yellowish fluid exudes from the mouth, of disgusting, fetid odour; abdomen much discoloured and distended; mammæ and pubes infantile in appearance; height good for age.

Rigor mortis marked in legs, feeble in arms.

On dividing integuments of head, liquid, dark, almost black blood literally pours out in a stream, although the head has not been dependent, and the body placed horizontally. Blood oozes in considerable quantity from the bone when sawn through.

Bones of skull thick, and inner surface of vertex of deep purple tint.

On the dura mater the large veins are prominent and dark, and some yellowish serum runs from the cut surface. On removing this membrane, three cysts, each the size of a filbert, appear lodged between the convolutions: one about the middle of the surface of the right hemisphere, an inch from the longitudinal sinus, the other two on the top of the left hemisphere. They contain a rather dirty-yellowish fluid, with one cretaceous-looking mass, size of millet seed, and several smaller masses in each. They are perfectly unattached, and fall out from the "arachnoid cavity." On separating the two hemispheres, several are found in the longitudinal fissure; none at the base, or in any other part of the brain.

Withdrawing brain, the pituitary body is found prominent, rising, with rounded surface, above the sella Turcica, and of pinkish-red colour. It is hard, and the anterior lobe is much larger than the posterior. Congestion of the base of brain very considerable; the occipital fossæ of the skull fill at once with dark blood.

Section of the left hemisphere presents little increase of vascularity. Consistence good; gray matter, thin. Right hemisphere similar in all respects.

In right lateral ventricle clear serum; in left pinkish. In the choroid plexus of right side, at junction of descending cornu with body, is a cyst (?), with shrivelled, thickened walls. Fornix soft; corpora striata and optic thalami of normal consistence and colour; tuber annulare pale; consistence normal.

Cerebellum dark; foliated structure especially distinct, owing to injection of gray matter, and great pallor of white.

Lungs healthy; some fluid in right pleural cavity.

Pericardium enormously large, containing a vast quantity of fluid; heart extremely dilated, and flabby; walls so thin that columnæ carneæ felt through them give to the touch the effect of varicocele. The right auricle, on its outer surface, is covered with rough lymph; no adhesions.

Cavities of the heart contain enormous clots of blackish blood. Foramen ovale is open sufficiently wide to admit thumb; but a fine fold of membrane is so stretched across it as to close it in

certain positions. This membrane is reticulate. The valves generally are healthy. Walls of right ventricle are of thickness of brown paper only; those of left are a little thicker. There is no marked contraction of any orifice.

So common an occurrence is convulsion in cyanosis, that the relation cannot be regarded as one of mere accident. Some years ago I examined the hearts of many children who had died either in or after "fits," and it so happened that in the first two of these I found the foramen ovale patent. In several others, however, this was not the case.

The hearts of twelve epileptics were examined by me during life, in order to ascertain the presence or absence of murmurs or other abnormal sounds. The ages of these patients varied from twelve to forty-six years, and they had been subject to the malady for periods ranging from two to thirty years. The result of examination may be seen in the following table:—

No. of case.	Sex.	Age.	Duration of epilepsy.	Condition of heart sounds.
1	F.	12	Since dentition	Palpitation frequent; nothing abnormal.
2	M.	16	Since infancy	Impulse forcible; sounds booming. Pulse 86—small, firm, regular.
3	F.	16	10 years ...	Apex, 2nd sound weak, but distinct. At base, 1st twanging and rough, 2nd distinct. Pulse irregular in rhythm—96 to 124.
4	M.	17	3 ,, ...	Normal.
5	,,	20	4 ,, ...	Apex, mitral; 1st booming, murmurish, tricuspid; 2nd sharp and distinct. Base, both much accented. Regular.
6	,,	21	14 ,, ...	Apex, mitral; 1st booming, murmurlike; ditto at tricuspid. Base, normal 2nd; short 1st. Pulse 72 mod. full and firm.
7	,,	30	28 ,, ...	Normal in all respects.
8	,,	30	15 ,, ...	Apex, mitral; 1st booming, long; 2nd indistinct. Normal in all other respects.
9	,,	34	15 ,, ...	Apex, mitral; 1st sonorous unduly. Normal elsewhere. Percussion area not increased, but lowered.
10	,,	42	2 ,, ...	Normal. Pulse full and regular.
11	,,	44	30 ,, ...	Base, 1st rather short, otherwise normal. Pulse 72—occasionally hesitating; feeble.
12	,,	46	7 ,, ...	Apex lower and more internal than natural. Impulse diffused; 1st feeble, irregular in force, no murmur, palpitation occasionally.

In no one of these twelve cases was there evidence of such valvular disease as should obstruct the flow of blood, or cause its regurgitation through any orifice; and, with the exception of the last, there is no indication of enlargement of the organ, either in part or as a whole. Increased sonorousness of the first sound, or its assumption of a "booming" character, was the most common modification observed; and this quality, supposed to depend upon the muscular element of the systole, may have been augmented either by irregularity of muscular contraction or its actual increase in force.

The Respiratory Organs.—There is no affection of the breathing apparatus to which epilepties are peculiarly prone. It is certainly by no means common to find them suffering from tubercular disease of the lungs. Among all the cases that have fallen under my care this complication has not once presented itself; and the fact is, I think, of importance because, in the minds of many, epilepsy has been associated with the strumous diathesis.

The respiration of some epilepties for a short time before the occurrence of their attacks becomes irregular, deficient, and suspicious; whereas in others no alteration can be observed. The pulse-respiration ratio, during the intervals of attack, I have not found to vary widely from that of health. It has ranged from 3·6 : 1 to 7 : 1; the latter ratio being observed in an individual who upon another occasion exhibited 4·5 : 1. Of eight males the mean-pulse frequency was 79·4, and the mean number of respirations 19·8—equalling very nearly 4·1.

Alimentary Organs.—In many epilepties there is perfect digestion. The individual exhibits no departure from physical health; the evacuations are regular, and of natural quantity and quality. In others, however, slight dyspepsia is common; and in a large number there is constipation of the bowels.

The form of dyspepsia which I have most frequently observed is that attended by a sense of fulness, or distention, and gaseous eructations; actual pain is not frequently encountered; nor is rejection of undigested food by vomiting. Many epilepties eat largely and voraciously; giving little mastication to their food,

and frequently, if left to themselves, choosing the most indigestible that comes before them.

The curious work of Mr. Jackson ("An Inquiry into the Nature and Causes of Epilepsy, with the Functions of the Spleen and those of the Thyroid Body") induced me some years ago to examine the spleens of many epileptic patients both before and after their attacks. The result, however, was that no constant relation could be established between the size of the spleen and the condition, *quoad* paroxysm, of the epileptic.

Genito-urinary organs.—There is no urinary change peculiar to epileptics, nor is there any deviation from health so common, or of such character that it requires mention among the "complications" of epilepsy. It must be remembered that for reasons already stated (p. 32), I am not dealing with "Urinæmia," nor with any of the forms of so-called "renal epilepsy," but with the disease as it exists idiopathically, *i. e.*, independently of any other demonstrable morbid condition.

In the male sex there is not unfrequently a morbid excitation of the genital organs, and this without its being evident that a causal relation exists between the two conditions. So far as I have been able to ascertain, it is as common for the epileptic to become salacious as for sexual excesses to induce epilepsy. (See p. 136.)

On the other hand, I have met with instances in which the venereal appetite has become extinct, and this without any previous undue indulgence. Moreover, it has occurred to me to notice in many instances, and in both sexes, that where epilepsy has been developed early in life, puberty has been retarded.

The frequency with which epilepsy originates at the period of puberty leads, naturally enough, to the inference that it is closely associated with sexual development (see p. 127); but it is difficult to ascertain positively the influence of the latter, when development is complete, upon the former. In the female sex the "complications" of epilepsy which exist in the uterine system are of no very definite character, and they lead to no practical conclusion with regard to the convulsive affection. Thus, of 17 epileptics who ought to be menstruating, the

catamenia were in every sense "regular" in 10; in 4 there was amenorrhœa for a longer or shorter period; in 2 irregularity as to time of the discharge; and in 1 menorrhagia with dysmenorrhœa. Moreover, uterine irregularities such as these have often been corrected, and this without any influence having been exerted upon the attacks.

CHAPTER V.

THE PATHOLOGY OF EPILEPSY.

"Est quasi terra incognita in qua quisque pro voluntate sua vagatur, et viam diligit jam factam, aut facit. Auctores de hac re multas plausibiles et populares fabulas effinxerunt; hæc vero omnia novimus esse nihil."—Brown.*

Physiology and pathology are equally important branches, or rather roots of the general science of biology. Life is not fully known until it is known in disease as well as health; the history of its investigation has often shown that links missing in the chain of evidence to support propositions with regard to one condition have been supplied from the apparently waste, because unconnected materials of the other. If the problem of biology may be stated thus: "Given an organ, to find its function, and *vice versâ*;"† that of physiology, as ordinarily understood, requires that we add in health; that of pathology, in disease. By the nature of the case, as determined by the definition of epilepsy, and the mode of proceeding already adopted in this work, the investigation of its pathology must, of necessity, be conducted in the direction last mentioned; and the *first* question we have to answer is, Given the symptoms of epilepsy, what is the organ upon whose modifications they depend? The *second* question we shall ask is, What is the nature of the change that organ has undergone? the *third*, How was that change induced? and the *fourth*, What are the links of connexion between that change and the phenomena of the disease?

I. In a fully developed epileptic paroxysm it is probable that every organ of the body is more or less affected, but that which we wish to know is the initial change, or constant start-

* *Tentamen medicum inaugurale de Epilepsia;* 1781.

† Thus, Auguste Comte says, "Étant donné l'organe ou la modification organique, trouver la fonction ou l'acte, et reciproquement."—Cours de Philosophie Positive, Tome III., p. 304.

ing-point and cause of all the phenomena. I say "constant," because the occasional starting-point may be a disturbed digestion, or a spinal lesion; and "initial," because it is not enough that we show the arrest of respiration, for example, to depend upon either closure of the glottis or other spasm. We have to discover wherein the symptoms have their origin when no spinal lesion is either to be demonstrated or inferred; and we have to show the anterior causation of such symptoms as laryngeal, or other spasmodic action.

There are two methods in which we may seek the knowledge required; one is inductive, proceeding from an anatomical investigation of the body; the other is deductive, being based upon the application of physiological and pathological laws, previously established by clinical observation and experiment.

Pathological anatomy has shown three things:—1. That there is scarcely any morbid condition which may not be found sometimes in the bodies of epileptics. 2. That no structural change is constantly found at all periods of the disease. 3. That some lesions are of more common occurrence than others. While this method, therefore, fails to demonstrate the seat of the disease, it furnishes proof that many lesions have no causal relation to its phenomena, and it affords presumptive evidence that other changes may be most duly regarded as its effects.

Among the latter we may class thickening of the bones of the skull; deposition of calcareous matter in the dura mater and its folds; enlargement of the pituitary body, with changes in its structure and in that of the pineal gland; and dilatation of the capillary vessels in the medulla oblongata. The rougher lesions first mentioned have been observed from the earliest time; and probably are due to the repeated congestions, which also render the skin and hair of the scalp coarse and unyielding.

Morbid conditions of the pituitary body are of frequent occurrence, and much importance was attached to them by Wenzel at the commencement of this century. From 1804 to 1808 he made twenty autopsies, and found that "toujours cette même partie était affectée."* The most frequent change was enlargement with alteration of contents;† and the pineal

* Observations sur le Cervelet, &c., traduit par M. Breton, p. 7.

† Op. cit., p. 191.

gland was more or less modified in all.* Upon the constancy of these changes, however, other authorities speak differently. Thus, Rokitansky says, "I have as frequently failed to discover the disease in those who had notoriously suffered from epilepsy and convulsions as I have met with it in other individuals who had been thoroughly healthy;"† and in this view of the matter Romberg concurs.‡ We must, therefore, regard changes in the pituitary body to be too inconstant for that organ to be regarded as the starting-point of the disease.

Schroeder van der Kolk has shown that enlargement of the capillary vessels and granular degeneration of the medulla oblongata are to be found in the bodies of epileptics; but his researches lead him to speak of these, not as the causes, but as the "proximate results of the fits."§ Van der Kolk's observations are of great value; but the method by which he arrives at his conclusion on the site of epilepsy is not anatomical or inductive, but the reverse.

The only other noteworthy attempt to fix the locality of epileptic disease by morbid anatomy, is that of MM. Bouchet and Cazauvieilh,‖ who advanced the proposition that it is due to a chronic inflammation of the white cerebral substance. The researches of these gentlemen are characterised by great ability and care, but they fail in their object, because other observers have met with different results; because epileptic attacks may be produced when the cerebral lobes have been removed, and because their observations were confined almost exclusively to patients who were the subjects of some forms of insanity.

The second method, viz., the deductive, by which it has been attempted to find the organ affected in epilepsy, has been more successful. Observation of the disease and the application of physiologic laws to its interpretation, have been made and attempted from the earliest period of medical history; but it is only of late years that the malady has been produced experi-

* Op. cit., p. 185.

† Manual of Pathological Anatomy. Syd. Soc. Trans., Vol. III., p. 434.

‡ Manual of the Nervous Diseases of Man. Syd. Soc. Trans., Vol. II., p. 207.

§ On the Minute Structure and Functions of the Spinal Cord, &c. Syd. Soc. Trans., p. 237.

‖ De l'Épilepsie considéré dans ses rapports avec l'Aliénation Mentale. Extrait des Archives Générales de Médecine.

mentally, and thus confirmation afforded to the conclusions towards which theoretical pathology was advancing.

So soon as the mind ceased to find any satisfaction in descriptions of the imaginary vagaries of "animal spirits," the attempt was made to fix the disease upon the structural changes of particular parts or organs of the body; but for a long time this attempt proved abortive, because no distinction was drawn between the constant element in, or essential organic cause of epilepsy, and those inconstant or accidental conditions which might operate either as remote causes of the disease or exciting causes of the attack. Thus a fibrous tumour of the uterus, a renal calculus, thickening of the spinal meninges, or carcinoma of the brain, were all spoken of as causes of the disease; and thus crept into science the terms, and what is worse, the erroneous ideas not yet expunged, but daily expressed in the words "uterine epilepsy," "renal epilepsy," "symptomatic epilepsy," and the like.

After a time, however, it was recognised that the nervous system was mainly and constantly at fault in epilepsy; but only by gradual steps were several portions of that system eliminated from the category of its causes. Georget referred the disease "exclusively" to the brain;* but Prochaska advanced further, and confined its source within narrower limits. After defining the "sensorium commune" as that portion of the nervous system which "is coextensive with the origin of the nerves,"† he says, "the sensorium commune also acts independently of consciousness in producing the convulsive movements of epileptics."‡ It is, however, to Dr. Marshall Hall that we owe our belief in this important principle; for the hint thrown out by Prochaska was one of many mere "guesses at truth," to which even its author attached but little importance; whereas Dr. Hall's observations led him to examine the problem thoroughly, and to leave little undone that could contribute to its solution.§ Schroeder van der Kolk has gone still further, and has argued with great

* De la Physiologie du Système Nerveux, Tome II., p. 366.

† Dissertation on the Functions of the Nervous System. Syd. Soc. Trans., p. 430.

‡ *Ibid.*, p. 432.

§ Memoirs on the Reflex Functions of the Medulla Oblongata and Medulla Spinalis.

force "that the starting-point of the various convulsive movements in epilepsy must be sought in the medulla oblongata."*

To this conclusion the mind has been conducted by a series of eliminations carried on by the accumulation of physiological facts and principles. The two essential elements of a convulsive paroxysm being involuntary muscular contraction and loss of consciousness,† some organ has been sought whence changes common to the two classes of phenomena should originate. The researches of Marshall Hall proved that convulsive movements were due not to the cerebrum, but to the spinal centre;‡ Weber demonstrated that while galvanisation of the spinal cord produced tetanic spasms, a similar irritation of the medulla oblongata induced spasmodic phenomena in a clonic form;§ and Dr. Todd showed that epileptiform convulsions arose from galvanisation of the mesocephalon and tubercula quadrigemina.‖ These results have all been confirmed by Dr. Brown-Séquard, who has shown that epileptiform convulsions occurred in his guinea-pigs after removal of all the encephalon except the pons varolii and medulla oblongata.¶ Similar results have been obtained by Kussmaul and Tenner.**

That loss of consciousness, or the abeyance of perception and volition, is immediately due to some change in the cerebral hemispheres, was a conclusion at once warranted by observations and experiments, which showed those hemispheres to be the organ of the mind. Comparative physiology and clinical experience had pointed out this truth, and it required only the experimental researches of Flourens,†† and their interpretation by Cuvier,‡‡ to demonstrate its correctness.

In one sense it is not correct to say that epileptiform con-

* On the Minute Structure and Functions of the Spinal Cord, &c. Syd. Soc. Trans., p. 213. † See p. 32.

‡ Memoirs on the Reflex Functions of the Medulla Spinalis, &c.

§ Wagner's Handwörterbuch, p. 16.

‖ *Medical Times and Gazette*, May 11, 1849.

¶ Researches on Epilepsy, its Artificial Production, &c., pp. 54, 55.

** Nature and Origin of the Epileptic Convulsions, &c. Syd. Soc. Trans., p. 69.

†† Recherches expérimentales sur les Propriétés et les Fonctions des diverses parties qui composent la masse cérébrale. Recherches, p. 85 *et seq.*

‡‡ Rapport de M. Cuvier, fait à l'Académie Royale des Sciences de l'Institut, published in Flourens' "Recherches," &c., 2nd edition. p. 60.

vulsions may occur when the cerebral hemispheres have been removed, for the fact of such removal is the cause of one element in the attacks, viz. loss of consciousness. This element, perhaps the most uniform in epilepsy,* is directly due to a negation, or arrest of function in the brain proper, and many theories have been advanced as to the mode in which that arrest is brought about. The commonly-received opinion is that "congestion" is its cause: upon this Dr. Marshall Hall argued;† and thus Dr. Bennett explained not only this element, but that of the convulsion.‡ That the congestion was a primary fact in the pathology of the attack, and hence that in the brain proper was the starting-point of the disease, was the earliest view, handed down from the time of Hippocrates to our own: but that it was secondary to the spasm and caused by the latter was the opinion of Dr. Marshall Hall; "the intervening links being (in his opinion) trachelismus and phlebismus."§ Against the current belief both Foville and Dr. Radcliffe protested, urging that the loss of consciousness occurred before there was evidence of congestion, and that perception began to return when the congestion was at its height.‖

A series of experiments have led to the proof not only that "congestion" is not a primary fact in epilepsy, but that, at the commencement of the fit at all events, there is no evidence of its existence, and consequently, that it is not the cause of loss of consciousness. M. Bernard has shown that after division of the sympathetic nerve in the neck there is an elevation of temperature and vascularity, not only in the superficial parts of the head, but in the cranial cavity and the cerebral substance itself.¶ Again, Donders and Van der Beke Callenfells have proved that irritation of these nerves causes contraction in the arteries of the pia mater; and the same observers, together with Dr. Brown-Séquard, have demonstrated that the arteries of the brain-

* See p. 32.

† Memoirs on the Neck as a Medical Region, &c.

‡ Library of Practical Medicine, Vol. II., p. 172.

§ On the Threatenings of Apoplexy and Paralysis, p. 31.

‖ Epilepsy and other Disorders of the Nervous System. Dict. de Méd. et de Chir., art. "Épilepsie."

¶ Leçons sur la Physiologie et la Pathologie du Système Nerveux, p. 493.

meninges contract through reflex stimulation;* the centre of such reflexion being the medulla oblongata. Now, it has been shown experimentally by Astley Cooper,† that compression of the carotid, and consequent anæmia of the brain, will induce loss of consciousness and epileptiform attacks: similar results of anæmia have been abundantly witnessed in clinical experience; and lately Kussmaul and Tenner have demonstrated the fact, and argued therefrom with great ability.‡ There appears, therefore, no reason for doubting that the immediate cause of loss of consciousness is arrest of the cerebral circulation, owing to contraction of the vessels, through irritation propagated along the vaso-motor nerves from the medulla oblongata; and thus the latter is shown to be the organ wherein both elements of the epileptic paroxysm may have their origin.

The conclusion to which experimental physiology has led is corroborated by the results of clinical experience. There is nothing to show that during the interparoxysmal period any special form of disease of any organ outside the nervous system, or of the body generally, is present in epilepties. More than half of the cases observed by myself were, in these particulars, absolutely well; and if the presence of but one impairment—either of strength, temperature, or nutrition—is disregarded, there were as many as 88 per cent. in confirmation of the proposition.§ Again, observation of epilepties, during the intervals of their attacks, shows that 38 per cent. were free from all impairment of their intellectual faculties; and that, disregarding failure of memory, there were so many as 70 per cent. with regard to whom it could be affirmed that the brain proper had undergone no important change.‖ On the side of motility the evidence was to show that in 26 per cent. nothing morbid could be discovered;¶ but that in the majority there were indications of disturbance. The more important fact, however, was that, of the three forms of involuntary movement described, clonic spasm was the most frequent.**

The evidence derived from attacks of epilepsia mitior with

* Researches on Epilepsy, &c., p. 64.
† Guy's Hospital Reports.
‡ Nature and Origin of Epileptic Convulsions. Syd. Soc. Trans., p. 101.
§ See p. 72. ‖ See p. 43. ¶ See p. 61. ** See p. 64.

spasm, and also from abortive seizures without loss of consciousness,* leads to the medulla oblongata as the most frequent starting-place of spasmodic action; for the nerves which are distributed to the muscles usually affected in these attacks originate in it. The disturbances of respiration, almost universally present in the severer seizures, point in the same direction.† But it must not be held that the medulla oblongata alone is the seat of primary change; the spinal centre is also involved, but the spasmodic actions which it determines are not so conspicuous, neither are they so characteristic. They may, nevertheless, be of the same kind and a part of the primary change.

II. Admitting that the medulla oblongata, or the upper part of the spinal axis, is the organ affected in epilepsy, we have next to examine the nature of its morbid change.

It has been already said that the change is not necessarily one of structure, *i. e.* it is not necessarily structural change of such kind as an interference with the textural integrity of the part. As function is in such way the property of organ that interstitial processes in the latter are the conditions of the existence of the former, it is evident that those processes must be altered either in quantity or quality. That they are so has been demonstrated by Van der Kolk;‡ but it has already been shown that such alterations are "proximate results of the fits,"§ and not their cause. The disturbance, then, is "functional," and we have to inquire whether it is one of kind or of degree.

It is the proper function of this portion of the nervous system to transmit impressions both motor and sensory, and to reflect certain afferent impressions, through efferent nerves, to muscles. Now, the essential elements of a convulsive paroxysm exist more or less frequently during health, and as a part of the healthy processes of the body. The unconsciousness of sleep is a normal phenomenon; the continuance of involuntary and even irresistible muscular movements is equally compatible with and necessary to normal life. The manner in which the former is brought about is not accurately determined, but the

* See p. 116.

† Van der Kolk, op. cit., p. 212.

‡ Op. cit., p. 244.

§ See p. 239.

most probable mode is that suggested by Dr. Laycock, viz. that the "access of affinitive impressions is arrested;" and that this depends upon "such changes in the medulla oblongata that the changes in the sensory nerves are not propagated to the organs of thought and will."* On the other hand, under the influence not only of the will but of emotion, sensation, and simply reflex impression, there are occurring hourly various muscular movements and changes in the superficial circulation. Respiration has its centre in the medulla oblongata; and, easy and tranquil as it is when no source of disturbance is at hand, it becomes suspirious or sobbing under emotion; yawning and irregular under fatigue; and positively arrested by fear, or by the effort required for a strong physical exertion. The teeth and the hands are clenched by anger; the face is distorted by grief, flushed by excitement, suffused by shame, and blanched by fear; and thus the phenomena of convulsions, dissected out as it were, occur in our daily life and as parts of our healthy activity. There is nothing to show, therefore, that the changes upon which epilepsy depends are of necessity modifications in the kind of function exercised by the organ from which it starts. Misplaced in time, in combination, and altered in degree, those functions are; but no new property is conferred upon the organ, nor is any natural power changed in the quality of its exercise.

If altered—but not in kind,—the functions of this reflective centre must be changed in degree; and we have to ask whether there is increased or diminished action. The answer is, I think, simple enough, if—setting aside ulterior questions as to the nature and cause of muscular contraction—we inquire what is the proper action of the organ. If it is to put in motion certain trains of muscular contraction, such as those conducing to respiration, emotional expression, and the like, then that action is increased, as well as misdirected at the onset of a fit. For not only is the symmetry of feature distorted, but violent movements of the face-muscles are induced; the eyeball is carried whither no voluntary effort could effect its movement; the tongue is crunched, and the teeth are broken by the for-

* Mind and Brain; or, the Correlations of Consciousness and Organization, Vol. II., p. 301.

cible champing of the jaws; the neck and head are strained to frightful extremes; the scream of the attack, and the arrest of respiration—now from one cause, such as a closed glottis, and again from another, such as fixed diaphragm and thoracic walls —are of the nature of violent exertion; and the torsion of the limbs and the vehemence of their movements are all of such kind as to demonstrate excess of action.

In the maintenance of equilibrium, the rest which results from opposed but balanced forces, there is power as active—it may be more so, although not so conspicuous—as in the tossing to and fro of the same forces when the balance is disturbed. But it is not all equipoise in healthy action, and one-sided action in disease. The ordinary movements of respiration are indications of unrest; the face is not actionless, when the mind and emotions are most healthy, but all its features are in play; there is not unchanging activity of brain during the whole lifetime of the healthy man, for in his waking and his sleeping hours there is the swinging to and fro of the pendulum of intellectual and moral life, now in relation with every impression from the external world, and again cut off therefrom by the mysterious barrier of sleep. In the paroxysm of epilepsy, on the other hand, at its severest moment, there is absolute balance of respiratory movement; muscles of inspiration and expiration are as it were "pitted against each other," and stand still with spasmodic energy; facial expression is lost, for it bears no relation to either mind or heart; and, again, the swinging to and fro of mental activity is arrested by an unnatural calm. In all this there is the evidence not only of disturbed equilibrium, but of distorted, misdirected, exaggerated power; and we must regard the paroxysm as the evidence of increased functional activity.

Dr. Radcliffe says, "The facts will scarcely warrant the idea that epilepsy is connected with anything like over-action of the nervous system. On the contrary, everything seems to point to a state which is the very opposite of this. Nor is it easy to understand how the medulla oblongata, the spinal cord, or any other nervous centre can be in a different case to the brain."* It may not be easy to understand how these things

* Epilepsy and other Convulsive Affections, pp. 168 and 172.

"can be;" but if there is such a thing as "action" on the part of the medulla oblongata, or the spinal cord, the facts appear to me to warrant no other conclusion, than that during the onset of the epileptic paroxysms there is "over-action" of these centres, and that such over-action is their proximate cause.*

But the terms "action" and "over-action," when used in regard of such an organ as the "reflecting" centre, require further analysis; for the property referred to is complex in its nature; involving, on the one hand, capacity for receiving impressions, and, on the other, the faculty of giving forth motor impulse. There is, in the reflex function, the conversion of an impression from without into a motor impulse from within. In health there is a due proportion between these two factors; in disease it is distorted; and either one may be increased.

Among some authors the distinction of these two properties was not always perceived; while by others it was recognised. Thus Trotter speaks of "a sensible, irritable, and mobile condition of nerves, by which different organs of the body, from slight causes, are urged into violent and involuntary action;"† whereas Fraser says of "irritability," that it is that "which disposes to be quickly acted upon by any cause of excitement;"‡ and Schroeder van der Kolk, again, states that the "primary cause (of epilepsy) consists in an exalted sensibility and activity of the medulla oblongata."§ On the other hand, in my own work on "Diagnosis," the impressibility and the motor-excitability of the reflex centre were distinguished; and it was said that "the exaggeration of the former induces increased readiness of action; that of the latter its exalted force or persist-

* Upon the hypothesis that muscular action is due, among other conditions, to the abstraction of nervous force, it would follow, as a corollary, that the excess of muscular action was due, *cæteris paribus*, to a diminution of nervous energy. This hypothesis is, in my opinion, incorrect; but, except so far as it bears directly upon the pathology of epilepsy, a discussion of its merits cannot be entered upon here. I shall hereafter point out that the evidence already derived (see p. 69 *et seq.*) from an examination of epileptics is strongly opposed to its reception.

† A View of the Nervous Temperament, p. 216.

‡ On Epilepsy and the use of Viscus Quercinus, &c., p. 16.

§ On the Minute Structure and Functions, &c. Syd. Soc. Trans., p. 237.

ence:"* and Dr. Brown-Séquard has urged that in epilepsy the latter property may differ much in degree, but that the former is constantly in excess.† This is, I believe, the correct view of the matter; the constant element in epilepsy is an undue readiness of disturbance in the centre of reflection; in some cases of epilepsia mitior, with little or no evident spasm, this is all the change that exists; whereas, in the more severe cases, where the convulsive element is highly marked, there is added to this change that of exalted motor-excitability.

The prevalence of clonic spasm, and of tremor, under conditions of slight derangement, indicates, during the interparoxysmal period, the readiness with which the equilibrium of health may be disturbed;‡ and the frequency with which emotional or moral commotion has occasioned the attacks is evidence of a like character.§ On the other hand, the frightful violence of some paroxysms, their want of proportion to the voluntary power of the individual, their persistence and recurrence, indicate the presence of motor impulse far exceeding that which is normal even in the healthy and robust.

That "morbid irritability" exists in the epileptic is admitted even by Dr. Radcliffe,‖ although his further analysis of this condition differs from that generally received; reasons have been given for regarding this as an exaltation of action, and reserving for the next section the question—how this over-action is brought about—the present may be concluded with the statement that the nature of the morbid change in epileptics is an exaggeration in degree of the functional activity of the medulla oblongata and upper part of the spinal axis.

Increased functional activity is the immediate result of augmentation in the interstitial metamorphosis of organ,¶ this being directly related to the supply of arterial blood and the size of the capillary vessels. Nutrition-change is altered; it is more rapid than in health; and the result is, as Van der Kolk has shown, enlargement of the capillaries and fatty or granular

* On Diagnosis of Diseases of the Brain, &c., p. 204.
† Researches on Epilepsy, &c., p. 58.
‡ See p. 64. § See p. 132.
‖ Epilepsy and other Convulsive Affections, &c., p. 174.
¶ See Chap. I., p. 12.

degeneration of the medulla.* In the first place, nutrition is affected dynamically and temporarily; there is no recognisable departure from textural integrity; there is merely the difference that exists in health and in all organs between action, over-action, and repose; after a time, and by frequent repetition of attacks, the changes, induced temporarily, become permanent, and the texture, which is the product of foregone nutrition-processes, is altered statically and persistently.

III. There are numberless modes in which the primary change of epilepsy may be brought about; the remote causes of the disease are as many as the organs of the body, and as various as the circumstances by which these may be affected. It must, however, be distinctly understood that such modes of inducing the affection are not essential, but that epilepsy is an idiopathic disease, or morbus *per se*,† and that the change in the spinal centre which has just been described may be the primary fact in its history. Referring to the chapter on Ætiology, it will be seen, that in 24 per cent. no remote cause of the first attacks could be assigned, and that in 18 per cent. there was defective evidence upon this point. It will be further seen that there is room for grave doubt as to the influence they exerted, so various are the conditions to which its origin was attributed.‡

Again, although experimental investigation has thrown much light upon the dark places of theoretical pathology, it has brought with it some confusion into the region of practical medicine. There are analogies and close relations between the convulsive phenomena of rabbits which are bled to death, of guinea-pigs with their spinal cords half-sundered, and the convulsive paroxysms of epilepsy; but the cases are not identical, and although experiment may elucidate the mechanism of the attacks—some parts of which may be the same in the two categories,—it may leave untouched the real pathology of the disease, the clinical history of which is peculiar to itself, and more or less widely different from those of the several paroxysmal affections artificially induced. This distinction has been seen by some of the able authors of these experiments; but it

* Op. cit., Syd. Soc. Trans., p. 240, &c.

† See Chaps. I. and II.

‡ *Vide* p. 132.

has been lost sight of by others, and therefore requires pointing out.

If, on the one side, it is said that convulsions are induced by cerebral anæmia;* by eccentric irritations;† by injury to the nervous centres, inflicted by disease upon the brain,‡ and upon the spinal cord,§ or experimentally produced by lesion of the former‖ or the latter;¶ by blood-disease,** and by general cachexia and debility,†† it must be said in reply that epilepsy exists when no one of these conditions is present; and that the utility of their observation, *quoad* the pathology of epilepsy, is to show how, when they are not present, the special phenomena of that disease may be brought about; and how, when they are present, they are related to the central fact in epilepsy.

Increased activity of the reflective centre may then exist by itself, be developed primarily, just as a similar kind of change may occur in other organs; and this in consequence of hereditary predisposition, congenital disposition, or subsequent morbid change. There is no reason why the organ at fault in this malady should not change primarily as well as any other organ, or as well as the whole congeries of organs which constitute the body. Deviation from health must commence somewhere, and in true epilepsy there is defect of evidence to show that it has commenced, or even after many years exists, elsewhere than in the part referred to.

In the cases examined by myself there were 30 persons, or 42 per cent., with regard to whom no cause of the attacks could be assigned: there were 39 in whom the first starting-point of morbid changes was believed to have been found, and these belonged to at least four great categories, viz. psychical, physical, general, and local influences.‡‡ So varied, therefore,

* Kussmaul and Tenner, op. cit.; Astley Cooper, Guy's Hospital Reports, Vol. I.

† Brown-Séquard, Researches, ant. cit., p. 30.

‡ Portal, Bright, Bouchet and Cazauvieilh, &c. &c.

§ Esquirol, Traité des Maladies Mentales, Vol. I., p. 311; Ollivier, Bouchet, and Cazauvieilh, &c.

‖ Flourens, Magendie, &c.

¶ Brown-Séquard, Researches, &c.

** Todd: *Medical Times and Gazette*, 1854, Vol. IX.

†† Radcliffe: Epilepsy and other Convulsive Affections.

‡‡ *Vide* Chap. IV., Ætiology, p. 132.

are the directions from which disturbing causes come that grave doubts may be entertained as to the efficieney or suffieiency of any of them; and we are led to regard as of far greater importance the constitutional condition upon which these disturbances may act.

The first method by which the disease may be developed in an individual is by its hereditary transmission, the peculiar organic condition descending from parent to child just in the same manner as may be seen to descend a speciality of feature, a morbid increase in the number of fingers, or a proclivity to tubercular disease. This occurs in a large number—nearly one-third of the cases;* but its admission does not explain the origin of the disease, it merely throws it back one, two, or more generations; and in the ancestry of the present race of epileptics, as well as in two-thirds of those living now, we have to look for other modes in which their malady may be developed.

A second method by which epilepsy is brought about is the operation of disturbing causes through the excess of their intensity. The organism is constantly exposed to impressions from without: looked at from one point of view, "life" may be said to consist in the reaction of the organs against stimuli; but there are limits within which the force of stimuli must be restrained, or the reactions become pathologic. Numerous illustrations of this principle at once present themselves in the categories of physical influences, such as heat, cold, and the like; and psychical incitements, such as mental strain, emotional disturbance, and so forth. Sunlight is one great stimulus of healthy activity; but "insolation" has induced, among other maladies, the epileptic: joy and sorrow, daring and caution, are healthy conditions of life, or incentives and safeguards of its powers; but violent emotion has been the cause of epilepsy. Within certain limits the influence of these agents is of advantage to the individual; there are reactions in the organism, witnessed in the glow of health, the flush of excitement, the strength of purpose and of action; the bounding pulse and rapid course of thought, or the repressed energy of caution, or bated breath of fear. But these conditions—resulting like the

* See Ætiology, p. 124.

tones of a musical instrument in response to the tender touch or powerful appeal,—are induced through physical arrangements, *i. e.* through "the reflective centre."

It is normal for the body and the mind to be influenced by these agencies, but if any one of them is excessive in duration, or too intense in its degree, abnormal consequences ensue. We need not suppose the pre-existence of any undue excitability when epilepsy has been induced by violent alarm, for the latter may have been so extreme as to suffice of itself to call forth this dire result, even from the healthy organism. When, however, the assigned causes of disturbance are of small intensity, we do infer the prior existence of predisposition.*

In some cases the operation of these influences is immediate in regard of time; in others the worst effects are delayed for hours, or even days.† The interval, however, is not unemployed; there may be external calm, but it is the veil concealing inward conflict and advancing evil. Alone and in silence terror is reproduced, and often with augmented power; the force of volition which has kept its expression in check, has not only strengthened its inner action, but has added a new element to the strife; and now, wearied and exhausted, it gives way before that system of vital activities, with regard to which it has been said it "never sleeps."‡ Dr. George Wilson has some interesting remarks upon this topic, to which the reader is referred.§

We must include in this category of causation moral commotion, some eccentric irritations, and physical influences, such as blows and insolation. By such means therefore we explain the origin of epilepsy in twenty-seven of sixty-nine cases,‖ and of these no fewer than seventeen were due to disturbances of psychical character.

Differing slightly from this method, there is another by which the epileptic condition may be developed, viz. by the occasional or frequent induction of an analogous state of the organism. In this manner pertussis passes into convulsion; coition or masturba-

* *Vide* Chap. I., p. 17.
† *Vide* Chap. IV., Ætiology, p. 133.
‡ Marshall Hall.
§ Life of Dr. George Wilson, p. 54.
‖ *Vide* Chap. IV., Ætiology, p. 132.

tion into epilepsy; and in the same way the latter has been developed by violent laughter from tickling of the feet.* In a similar manner—and perhaps, too, according to the order first described—must be explained those cases in which one person has become epileptic from witnessing another in the attack. This occurs sometimes without alarm, and so free from the latter that the disease has been regarded as "contagious."†

In the former class the altered condition of the medulla is induced by the violence of an external impression; in this, by the frequency of impressions, which may not individually be abnormal in force.

More important, however, is that mode of causation by which the medulla is involved in some general morbid metamorphosis. Thus epilepsy has been regarded as the expression of such cachexiæ as syphilis, scrofulosis, rheumatism and the like.‡ It has been said to be due to a changed condition of the blood, such as urinæmia; § and to a depressed state of vitality in the whole organism.‖ But is this a correct mode of viewing the phenomena and their relations? In regard of the vast majority of cases of true epilepsy,¶ I answer it is not, and for the following reasons.

Allowing, on the one hand, that these conditions may be the occasions of "convulsion;" and, on the other, that we may find true epilepsy in a syphilitic, urinæmic, or anæmic patient, it is plain, from the facts already stated,** that these are exceptions, and not the rule. The clinical history of convulsions, arising from syphilis, scrofula, rheumatism, and Bright's disease, differs widely from that of epilepsy; and bears a relation thereto similar to that which chronic bronchitis with dyspnœa—dependent upon, or occurring during the course of,

* *Vide* Chap. IV., Ætiology, p. 135.

† "Contagiosum esse affectum etiam credidit Antiquitas."—Van de Wiele, Disputatio Med. Inaug. de Epilepsia.

"Despuimus comitiales morbos, hoc est, contagia regerimus."—Plin., Nat. Hist., Lib. XXVIII., Chap. VII.

‡ Brown-Séquard, Researches on Epilepsy.

§ Todd, Clin. Lect., *Medical Times and Gazette*, Vol. X., 1855, p. 205.

‖ Radcliffe, Epilepsy and other Convulsive Affections.

¶ *Vide* p. 33 *et seq.*

** In Chap. III., pp. 76, 77.

those dyscrasiæ—occupies to spasmodic asthma. Whereas the statement that epilepsy is an expression of general debility, is directly contradicted by facts which show that no such debility exists.

The frequency with which convulsions occur and prove fatal during the first two years of life may in some measure account for the comparative rarity with which such phenomena are recorded in the past histories of epileptics,* inasmuch as individuals who might become epileptic may be removed by death. The inference, however, is that the tendency to the two diseases is not identical; and this inference is further supported by the freedom of epileptics from eclampsia parturientium.† The cachexiæ which are supposed to produce epilepsy not only do not produce this effect, but, after the period of infancy is passed, they rarely produce convulsions unless there is distinct development of structural disease in the nervous centres or their meninges. Thus Louis states that "rigors" were absent in one-sixth of the cases of phthisis observed by himself, and that cerebral symptoms were "almost always connected with the development of tuberculous granulations in the pia mater;"‡ and although he mentions "persistent contraction," as observed "in some cases for a certain time,"§ he does not enumerate convulsions among the symptoms of the disease. Andral, again, writing on tuberculosis, speaks of "l'absence générale des symptômes du côté du système nerveux;"‖ and Walshe, in regard of the carcinomatous cachexia, states that "no actually prominent cerebral symptoms occur unless the contents of the cranium have become the seat of morbid deposition."¶ An argument similar to this was urged by Pew,** nearly eighty years ago; but still, although I am not aware of any facts which should establish the position that epilepsy is induced by these cachexiæ, it is common enough to hear such a mode of production asserted as a generally-received principle of pathology.

* See Chap. IV., Complications, p. 226.
† See p. 226.
‡ Researches on Phthisis. Syd. Soc. Trans., p. 280.
§ *Ibid.*, p. 281.
‖ Clinique Médicale, Tome III., p. 344.
¶ Nature and Treatment of Cancer, p. 127.
** Medical Sketches, p. 30.

The irritability of the muscles, as elicited by percussion in cachectic diseases, where the nervous centres are profoundly affected, is very commonly, if not invariably, exalted. This I have witnessed constantly in tubercular meningitis and urinæmia; but in the epileptic the reverse condition of irritability exists. I have never been able to induce contraction which should be visible, by this means, in an epileptic. No argument is to be based on this as against the general proposition of augmented nervous irritability; for I have shown that the reactions to galvanism, which affects the nerves, and to percussion, which affects the muscles, differ in the same individuals;* and Bernard has established the independence of these systems by his experiments with the curari poison, which "tue complétement le système nerveux moteur sans diminuer en rien l'aptitude qu'ont les muscles."†

Fifty-six per cent. of the epilepties examined by myself were free from all cachexia; they were in perfect health of body.‡ There were only 10 per cent. who exhibited serious impairment. In some or all of these ten there may have been a cachexia present, the only form which its expression had taken being epilepsy. I cannot deny this hypothesis, but there is no evidence in its favour; there were not present the ordinary characters of the dyscrasiæ, and the inferences to be drawn from the other cases reduce the hypothesis almost *ad absurdum*.

Convulsions occur without dyscrasiæ; the latter exist without the former; they may co-exist, but when they do, the cases differ from epilepsy both in general clinical history and in special symptoms. We must conclude, therefore, that true epilepsy is not shown to be the result of dyscrasiæ.

Still more defective is the evidence to show that epilepsy depends upon some un-named, indefinite condition of general debility, anæmia, cachæmia, or the like; and that such general condition is the prime fact in its history. In more than half of the cases no such debility exists; in an extremely small number does it pertain to a notable degree. Epilepsy may be found in

* On the Condition of the Muscles in Hemiplegia, *Lancet*, 1855.

† Leçons sur la Physiologie et la Pathologie du Système Nerveux, Tome I., p. 199.

‡ See Chap. III., Semeiology, p. 72.

individuals whose physical health and strength are above the average (p. 73); and, further, each kind of deterioration in general health or vigour is the exception, and not the rule. The pulse has the firmness and frequency of health; and such impairments of vigour as do exist are less common than failures in mind or disturbances of motility.*

Of greater value is the argument to be derived from a comparison of the general health with the frequency of attacks;† from which it is evident that instead of a low condition of vitality favouring the recurrence of fits, the reverse is true; and the paroxysms are shown to be most frequent in those whose organic vigour is unimpaired. Further, if any influence is exerted upon the severity of the attacks by the condition of the general health, it is to this effect, that in impaired health the seizures are mainly of epilepsia gravior, whereas when the individual is robust there are paroxysms of "le haut" and also of "le petit mal." This follows, as a corollary, from two positions established by an examination of the natural history of epileptics:—1. That epilepsia mitior is not vicarious of, but rather an addition to, the attacks of epilepsia gravior, occurring in those cases which present a high rate of frequency of the latter;‡ and, 2. That a high rate of frequency of the severe seizures is associated with a vigorous state of health.§

Again, interrogating the disease in such wise as to ascertain whether the mental failure which often accompanies it is to be referred in any way to the state of the general health, it was found that where the latter was exceedingly good, there was a greater tendency than existed in epilepties generally to deterioration of the mental capacity; and that so soon as the organic vigour failed, and in the degree to which it failed, the intellectual powers relatively improved.‖

The loss of health and strength appears related in such way to disturbances of motility that the two elements, or phases of vitality, deteriorate *pari passu*. It is evident, however, that this relation is not essential;¶ and that the several functions of organic life occupy different relations to the three modes of motor disturbance. Thus, with impaired nutrition, tremor and

* See p. 77. † See p. 158. ‡ See p. 153.
§ See p. 159. ‖ See p. 179. ¶ See p. 197.

tonic spasm are not commonly associated; while clonic spasm is. With defective strength, tremor and clonic spasm are common, but not tonic contraction; whereas with diminished temperature we find tremor and clonic spasm frequently, but tonic spasm rarely. By far the most important of these three forms of motor disturbance is clonic spasm, and this is found more commonly when the general health is deteriorated in each particular than it is under the opposite conditions.*

There is one other point of interest in this inquiry, and it is this: that there is nothing to show that the duration of epilepsy is determined by the physical health, or *vice versâ;*† and from this we may infer that neither one is the cause or the effect of the other.

Since, then, epilepsy exists without impairment of the general health or vigour, and this in the majority of cases; since, when organic debility is found in epilepties, the convulsive malady is less frequent and less severe than in the opposite condition; since the failure of mental power is in inverse ratio to that of the general health and strength; and, lastly, since the duration of the one condition does not influence the other, we may conclude that epilepsy is *not* dependent upon debility, anæmia, cachæmia, or any such condition. This argument with regard to epilepsy is, I think, unanswerable by any reference to experiments such as those of Kussmaul and Tenner, Marshall Hall, Astley Cooper, and others, which show that convulsions may be induced by sudden anæmia of the brain. Convulsions occur in epilepsy, but do not of themselves constitute that disease; they must have a special clinical history to do so; and it is epilepsy, and not convulsions only, that we are now examining.

If the general conditions just mentioned are not shown to be the causes of epilepsy, we ask—Are there any others which occupy that relation? The answer must, I think, be in the affirmative. The nervous centres are involved in such changes as affect the nutrition of the whole organism, and these changes may be morbid in degree or kind. For example, during dentition, puberty, and pregnancy, there is rapid development and increased metamorphosis of tissue, and this is normal in kind;

* See p. 194. † See p. 198.

whereas, in an attack of pneumonia or rheumatic fever, there is augmented change, and this is abnormal in its nature. It must be remembered, however, that in the former category there are usually, combined with the general condition of increased activity, some local causes of irritation, such as are to be seen and felt in the gums, the ovaries, or uterus.

In whatever way they may exert their influence, there can be no doubt that a powerful influence is exerted by both dentition and puberty.* The largest number of cases commence † from ten to fourteen years of age, and the next largest from fourteen to twenty-four. Among my own cases by far the most frequent age for epilepsy to show itself was from thirteen to fifteen years. Nearly twice as many occurred during that period as were to be found in any other period of equal duration. An examination of the researches of Delasiauve,‡ Herpin,§ Hasse,‖ and Calmeil,¶ demonstrates the influence both of puberty and dentition. Dr. Bright drew attention to these facts in the history of epilepsy, showing that it commenced most frequently during "leading periods in the evolution of the frame."** There can be but one opinion as to the facts themselves; the only question is as to the mode in which they are related.

There is nothing necessarily morbid in these "leading periods in the evolution of the frame;" and what they have in common is an augmented activity of the metamorphic processes of nutrition. That which for the bones and muscles results in the increase of material and of force; which in the secreting organs resolves itself into these, *plus* a larger quantity of the secretion; which in certain special systems effects a new development, such as that of dentine, enamel, and cementum; of spermatozoa, Graafian follicles, mammary gland-tissue, adipose tissue, and hair; and which in the brain and its contiguous ganglia eventuates in new thoughts, sensations, and emotions,—becomes in the system of reflex actions the source of new combinations of the latter, and

* See Chap. IV., Ætiology, p. 126.

† Leuret, Arch. Gén. de Méd., 4me. Série, Tome II., 1843.

‡ Traité de l'Épilepsie, p. 198.

§ Du Pronostic et du Traitement, p. 335.

‖ Virchow's Handbuch.

¶ Thèse sur l'Épilepsie.

** Reports of Medical Cases, p. 510.

of exalted impressibility or readiness to act. Each system of organs may pass through the change without entailing disease upon the individual; but while the very fact of increased activity may be a safeguard against certain forms of malady, it is no less surely the means by which other forms may be induced. Augmented activity in the nutritive processes of the medulla oblongata and spinalis is the prime and essential fact in epilepsy; it needs the addition of but an "exciting cause" to set in motion the whole train of phenomena which constitute the attack.

In this manner, also, we may explain the operation of such causes as induce augmented metamorphic activity,—not of a normal, but of an abnormal kind and degree. In pneumonia, and in fever of all kinds, there are set up changes, more or less evident, in the nutrition of all organs. On the part of the brain, we witness delirium, vertigo, and headache; in the excretions we recognise the products of increased and altered secretion;* in the temperature of the body we find evidence of exalted oxygenation;† and on the part of the reflex system rigors, convulsions, and epilepsy. Of the two former we know well that the one is a common phenomenon in the adult, the other in the child; whilst the last is, comparatively speaking, rare. Nevertheless, there are cases in which epilepsy dates its origin in this manner;‡ and the analogies presented by other physiological and pathological facts enable us to explain its causative conditions.

Nine of the cases examined in the previous chapters have originated in the manner now described: six of these during more or less normal exaltations of activity, such as dentition, menstruation, pregnancy, fatigue from over-exertion, and the arrest of lactation; and three during disturbed as well as augmented nutrition-change, viz., convalescence from pneumonia, rheumatic fever, and the effect of shock upon the fœtal circulation. Of course, in the nine cases referred to, the assigned causes were directly traced into the first attack; and there remains, over and above this evidence of the influence of general nutrition-changes, that to be derived from the facts already stated, viz. that epilepsy commenced in these, and in others—

* Parkes on Urine, p. 236 *et seq.*

† Sidney Ringer, Medico-Chir. Trans., 1859.

‡ See p. 132.

i. e. both with and without these definitely assigned causes—in eight individuals during the first dentition, in ten during the second, and in twenty-three during the development of puberty.* Thus, in forty-one of sixty-nine cases, the disease became developed while the organism was in the condition of rapid, exalted nutrition-change.

It is difficult to ascertain the precise value to be assigned to the different causative conditions which may coexist in the same individual; for we may have in one person hereditary predisposition, the nutrition-change of puberty, some eccentric irritation, such as dysmenorrhœa, such provocative as the induction of analogous conditions by the venereal orgasm, and, moreover, a morbid metamorphosis, such as rheumatic fever; in another we may find but two, or one of these, or even none at all. An examination of the whole series of cases will alone enable us to recognise the value of each category of causation. The influence of hereditary predisposition upon the age at which epilepsy commences has been already given;† and the following table will show the inter-relations of three categories of causation as they existed in forty-eight individuals, forty of whom belong to the series already examined frequently, and eight to another series only occasionally included in the foregoing analyses.

Causative conditions and their combinations.	Males.	Females.	Both sexes.
1. Without any known cause	4	2	6
2. With hereditary predisposition only	0	0	0
3. With hereditary predisposition + some general organic change, such as dentition, puberty, &c.	3	3	6
4. With both of these + some definitely operative, occasional, or exciting cause	5	1	6
5. With some general condition of organic change as the only cause	6	4	10
6. With this + some exciting cause	5	7	12
7. With a definite exciting cause only	5	2	7
8. With this + hereditary predisposition	0	1	1
	28	20	48

* See Chap. IV., Ætiology, p. 132.

† See p. 129.

The most interesting fact elicited by this examination is that there were only six of forty-eight cases with regard to whom the origin of epilepsy was altogether inexplicable; and of these six it must be added that in two of the males there was some doubt as to the presence or absence of "exciting cause." Of forty-six epileptic individuals, therefore, there were but two in whom the commencement of the disease was altogether irreducible by pathologic laws.

The next fact of importance is that hereditary predisposition in no one case operated alone. This would follow partly, as a corollary, from the principle already established, viz., that hereditary epilepsy is usually developed before or at the time of puberty.* The one case in which it was delayed beyond that period was a girl, æt. 19, in whom the outbreak was attributed to mental and emotional disturbance, *plus* some eccentric irritation. But, over and above the predisposition from inherited tendency, and the disposition of body induced by special organic developments, there were six individuals in whom some further and "exciting cause" was operative.

For our present purpose, however, the most interesting fact is that there were ten persons in whom epilepsy could be ascribed only to the increased activity—preternatural in these cases we must assume — which in kind constituted, and in degree exceeded, that proper to the period of life in which the disease was developed. In twelve others there were, in addition to the general metamorphic activity, some locally-disturbing "occasions" of the attacks. Further, in no less than thirty-four of forty-eight cases can we trace the sole or conjoint influence of the cause we are now considering—viz. developmental activity of nutrition,—in the production of epilepsy.

When the period of life was in itself the sole predisposition, *i. e.* when hereditary taint was absent, there was nothing peculiar or special in the mode or locality of action of the exciting cause. Thus, in the twelve cases forming this category, there were to be found psychical or emotional perturbations; eccentric irritations; physical influences, *e. g.* insolation, contusion; analogous conditions, venereal excess; and intra-uterine

* See Chap. IV., Ætiology, p. 129.

commotion: the most frequent of these being, as might be expected from the general history of causation,* the first, viz. psychical. The predisposing influence of this condition appears, then, to be general; and this inference is further warranted from the fact already stated,† that local changes, as of menstruation, for example, have little effect upon the fits. The recurrence of attacks at a monthly period is as common in the male as in the female; it is not, therefore, the uterine or ovarian, but the general, condition which is prominently related to the disease. Further, although epilepsy has commenced in many individuals during the first and second dentition, it is only in two cases that there has been such notable local irritation from the process as to have induced the parents or friends of the patients to assign "teething" as the exciting cause of the attacks.

The morbid general conditions upon which epilepsy was superinduced, viz. pneumonia and rheumatic fever, occurred in both cases without hereditary predisposition; they were both females; the sufferer from pneumonia was seven years of age, and had been highly stimulated during her convalescence from the disease; the rheumatic fever occurred in a person æt. 20. In the instance in which fright of the mother during pregnancy was the assigned cause, the attacks commenced within the first year of life. With the exception, therefore, of the case dating from rheumatic fever, there were conditions of proclivity other than those of the assigned "exciting causes."

The last mode in which the medulla oblongata and the upper part of the spinal axis may become so affected as to produce epilepsy is by the operation of morbid, accidental, or experimental lesion in some portion of the nervous system. That cerebral or spinal tumour, chronic inflammation of the meninges, softening of the brain, neuromata, &c. &c., might occasion convulsions of epileptiform character, has long been known; but it has been frequently urged in this work that these cases are to be distinguished, in the majority of instances, from true epilepsy. Their clinical history differs either altogether, except in the mere existence and general form of the attack; or in part,

* See p. 132. † Chap. IV., Natural History, p. 149.

there being perhaps true epilepsy, but, over and above this, the phenomena of structural disease. In some cases it would appear, however, that the course during life has been that of epilepsy, but that, *post mortem*, some lesion is found, of the existence of which no symptoms had aroused the suspicion. These cases are, I believe, very rare; and as observation is extended and rendered habitually more minute, they will be found still more exceptional.

The immediate cause of epilepsy is, as has been said, over-action of the reflective centre, from increased vascular supply, and exaggerated nutrition-change. This state may be induced by structural change:—1. In that centre. 2. In contiguous portions of the nervous system. 3. In portions, not necessarily contiguous, but functionally related.

Esquirol was one of the first to draw marked attention to the existence of spinal lesions in epileptics. In nine of ten cases he found alterations in the cord or its meninges;* and observations are numerous to the same effect.† It must, however, be remembered that the reflective centre is frequently found free from all such lesions. We must, therefore, regard them when present as operative only indirectly; that is, by inducing ulterior changes, which latter are the proximate conditions of the disease. This follows from the principles already laid down in the first chapter of this book.‡

But lesions may be found outside the centre of reflection, and yet within the nervous centres, such as tumours within the cranium, &c. When so situated, they may induce epileptiform seizures in one of two modes: either by their irritant effect upon afferent nerves, such as those in the meninges; or by the extension of vascular activity from them, as its centre, into the contiguous medulla oblongata. In regard of the former mode, Pflüger has shown that when a cerebral nerve is injured the tendency is for reflex excitability to travel downward, *i. e.* towards the medulla oblongata.§ Upon analysing a consider-

* Traité des Maladies Mentales, Tome I., p. 311.

† *Vide* Brown-Séquard's Researches on Epilepsy.

‡ See p. 11.

§ Die sensorischen Functionen des Rückenmarks der Wirbelthiere, p. 80 *et seq.*

able number of cases, for the purposes of diagnosis, I found that "convulsions are most frequent in tumours of the cerebellum; and that they diminish in frequency as the seat of lesion advances forwards, *i. e.* through the posterior and middle to the anterior lobes of the cerebrum."* From this it may be inferred that the latter mode above described is the more frequently exemplified.

More instructive facts, however, with regard to this portion of the pathology of epilepsy, are those furnished by the experimental researches of M. Brown-Séquard.† It has been proved beyond all question that attacks closely resembling those of epilepsy may be induced in certain mammalia by injury to the spinal cord, especially by cutting through one of its lateral halves, or by dividing the posterior columns and cornua of the grey matter; the implication of the latter being apparently essential.‡ But the attacks are not immediate results: they follow in the third or fourth week; showing that they depend upon some induced condition; and from their commencement in those parts which are innervated from the medulla oblongata, we infer that it is this portion of the nervous reflective centre in which exists the primary change of epilepsy proper. This passage upwards towards the medulla oblongata of changes commencing in the extremities and in the spinal cord was recognised long ago, but systematized especially by Pflüger.§ Brown-Séquard inferred that the medulla oblongata had its nutrition changed by paralysis of the vascular nerves;‖ while Van der Kolk has proved by microscopic examination, showing dilatation of the capillaries,¶ that this inference is correct.

Of great interest is the further fact established by Brown-Séquard, viz. that with the change in the central parts there is also an alteration in the condition of some centripetal nerves, or of their peripheric expansion. The paroxysms are induced by irritation of the latter, and sometimes cured by its cauterization. The nerves undergoing these changes are the second and

* Diagnosis of Diseases of the Brain, &c., p. 186.

† Researches on Epilepsy, &c. ‡ Op. cit., p. 4.

§ Die sensorischen Functionen des Rückenmarks der Wirbelthiere, p. 86.

‖ Op. cit., p. 69.

¶ On the Minute Structure and Function, &c., p. 244.

third branches of the trigeminus, with the second and third cervical nerves on the same side as that to which the injury was inflicted.* Epilepsy, then, may be regarded as consisting "mostly in this increased excitability"† of the spinal axis; but when induced artificially in the manner described, not only is the centre implicated, but some afferent nerves share in the exaltation of functional activity. Hence we may understand the nature of those cases (see Cases IV. to VII.) in which the attacks are more or less closely related to peripheral changes, constituting the different forms of "aura." The latter are not essential; they are additional phenomena, induced by the nature and locality of the lesion which set up, with them, the convulsive conditions.

From the earliest periods of medical history it has been known that injury done to the nervous trunks, or even to their peripheral expansions, might induce convulsions, tetanus, or epilepsy. Pflüger has, in his work already quoted, collected cases which illustrate this point.‡ Brown-Séquard mentions the fact of an accidental bite in the foot of one of his guinea-pigs having been followed by epileptiform convulsions, which were cured by section of the sciatic nerve;§ and Van der Kolk suggests, what is probably the true relation of these groups of phenomena, viz. that the "constant nervous irritation," caused by such injuries, gradually affects "in the same manner," the medulla oblongata.‖

The characteristic feature of epilepsy is the occasional occurrence of loss of consciousness, with spasm; this of itself may constitute the disease. Such combination results from over-action and over-excitability of the medulla oblongata and upper part of the spinal axis: this functional change is brought about in various ways, viz. by hereditary predisposition, by violent impressions from without, by general conditions of exalted nutrition-change, by morbid or artificial lesions of the nervous centres, and by eccentric irritation: when any one of these causative conditions exist, there are some immediate as well as indirect results of their operation; such as pain, spasms, para-

* Brown-Séquard, op. cit., p. 6.
† Op. cit., p. 35.
‡ Pflüger, op. cit., pp. 88–90.
§ Brown-Séquard, op. cit., p. 30.
‖ Van der Kolk, op. cit., p. 221.

lysis, &c.; these may remain stationary, they may be diminished, and perhaps arrested; but they may, on the other hand, increase and extend: when they have reached a certain point—and this may be attained suddenly by the conjoint operation of external causes, or gradually, by progressive development within,—they induce that combination which is characteristic of epilepsy, viz. paroxysmal loss of consciousness and spasm. Not until this point is reached does epilepsy exist; after it is attained, all the other phenomena—of "le haut mal," for example—may be explained, and their true nature—as consequences or complications of the essential fact—may be understood. The turning-point, wherein nervous excitability and its effects becomes epilepsy, is, then, the involving of the medulla oblongata and its immediately contiguous parts in an exaltation of functional activity, and this to a certain degree.

IV. The central fact of epilepsy brings into operation various muscular movements; and their results in respiration, circulation, secretion, and the like, have now to be examined. It will be well to separate the paroxysmal and interparoxysmal, and to consider the former in the usual order of their occurrence, reserving to the last the pathology of those intermediate phenomena which have been termed the "aura epileptica."

Dividing the paroxysm into three stages,* we have to encounter the simultaneous development in the *first* stage of six symptoms.

1. Loss of consciousness, or of volition and perception, is due at this period, as has been already shown (p. 244 *ante*), to the arrest of vascular supply by spasmodic contraction of the cerebral vessels.

2. Tonic contraction of the muscles, extending from those of the face to the neck, trunk, and extremities, is the direct expression of undue action in the medulla oblongata, passing downwards to the spinal cord.

3. Arrested respiration may be induced by one or both of two causes, either spasmodic closure of the glottis, or fixation of the chest-walls and diaphragm. That the former is not of so much importance as was thought by Dr. Marshall Hall† has

* See Chap. III., Semeiology, p. 103.

† Memoirs, Synopsis. Aperçu, &c.

been proved by the results of practice upon his own suggestion, viz. that of tracheotomy for the alleviation of the malady. In the case of a man whose trachea was opened by Mr. Henry Thompson, at the instigation of Dr. Hall, the fits recurred notwithstanding the perfect patency of the tube; and once, while I was talking to him, and had removed the inner canula, an attack came on, which gave me the opportunity of seeing that the face darkened, the consciousness was lost, and that the respiration ceased absolutely for nearly thirty seconds; and this under circumstances in which, were closure of the glottis present, it could exert no influence. Again, in Andrea Verga's case, a patient suffered "an die heftigsten Anfallen" for three years, notwithstanding the existence of a fistulous opening into the trachea, the opening or closing of which had no effect upon the paroxysms.* The other mode in which respiration is arrested is, probably, operative in all cases of epilepsy; the "diaphragm, as well as subordinate muscles concerned in the performance of that function, are equally and similarly affected with the muscles of other parts of the body."†

The epileptic cry has been variously interpreted. It is by no means always present. According to Herpin, who examined thirty cases in this particular, and found it constant in only nine, "le cri est à la fois l'expression de la surprise et de la douleur produite par la convulsion."‡ Delasiauve attributes it to the convulsion, or to pain or surprise.§ M. Sandras speaks of it as "sans signification autre qu'un trouble notable de la respiration."‖ Brown-Séquard says that "loss of consciousness, which is equivalent to the loss of the brain, allows a cry to take place by reflex action."¶ Van der Kolk, however, was once "assured" by a patient "that he heard the shriek, but was unconscious of everything after it;"** and it has occurred to me to meet with a similar case. An intelligent member of the

* Gazz. Med. Ital., Lomb., 1852. Quoted in Schmidt's Jahrbücher, 1852, IV., p. 157.

† Jackson. An Inquiry into the Nature and Causes of Epilepsy, p. 69.

‡ Du Pronostic et du Traitement, ant. cit., p. 427.

§ Traité, ant. cit., p. 77.

‖ Traité pratique des Maladies Nerveuses, Tome I., p. 99.

¶ Researches on Epilepsy, p. 74.

** On the Minute Structure and Functions, &c., p. 238.

medical profession became subject to epileptiform seizures, and told me that, on one occasion, he heard himself making the noise, and could not, although he tried, prevent himself from doing so. He was quite conscious, was free from pain or fear, and motioned to his little boy, who was playing in the room, to leave it. He was heard uttering the cry, from the floor above, and was found unconscious: he remembered seeing the child go out of the room, but after that lost himself.

Without denying that, in some instances, the cry may be the expression of pain or emotion—for the proof of which the evidence is deficient,—we may conclude that it is a spasmodic phenomenon* occurring during the tonic stage of the attack, and sometimes before this has involved the cerebral lobes. Its production is, I think, of the same character as is that of movement of the head or whole body towards one side during this period, owing to the spasm being stronger on one half of the body than the other. Sometimes the noise is expiratory, sometimes the reverse; but in either case it is caused by the want of perfect balance between the systems of expiratory and inspiratory muscles.

4. Pallor of the face, or duskiness; or the former succeeded by the latter. Whytt says, "Some grow pale upon anger, which effect may be owing to a spasm or continued contraction of the small arteries of the face, by which the motion of the blood in them will be retarded."† He refers "rigors" to the same cause, "in consequence of the irritation which the nervous system suffers."‡ Crichton, however, speaks of "terror" as distinct from "fear" in its effects upon the "animal system," and as being associated with a "preternatural degree of force and action."§ Alibert says, in regard of fear, that its first effect closely resembles "rigor:" "Ceux qui l'éprouvent sont affectés d'une sorte de resserrement spasmodique; leurs muscles tremblent, leur visage pâlit."‖ Goodman states, that "complete

* Brown-Séquard, Hasse, Marshall Hall.

† Observations on the Nature, Causes, and Cure of those Disorders which have commonly been called Nervous, &c., 1767, p. 64.

‡ *Ibid.*, p. 221.

§ An Inquiry into the Nature and Origin of Mental Derangement, 1798, Chap. II., p. 267.

‖ Physiologie des Passions, 1827, Tome I., p. 168.

contraction of the capillaries may be observed by the naked eye occasionally in children who have been chastised with the open hand."* Delasiauve, who constantly observed pallor at the commencement of epileptic attacks, asks, "Ne proviendrait-elle point d'une espèce de paralysie momentanée qui frappant d'inaction les organes circulatoires, produirait en même temps qu'une constriction des tissus et le retrait du sang, une sorte d'atonie des capillaires?"† The true nature of the condition, however, is to be gathered from the experiments of Bernard,‡ Brown-Séquard,§ and Waller and Budge, by whom it has been shown that the sympathetic is the motor nerve of the vessels of the face, and that this arises from the same part of the spinal cord as do the branches to the iris, viz. that included between the last cervical and third dorsal vertebræ. Irritation and over-action of these nerves, then, causes contraction of the vessels and pallor of the face. The phenomenon is of the same character in its causation as the loss of consciousness; it is not of the nature of paralysis, inaction, or atony,‖ but of spasm, as was long since suggested by Whytt, and finally developed to the full by Lister.¶

Duskiness of the face, when occurring at the onset of an attack, is probably due to "trachelismus," as originally suggested by Dr. Marshall Hall.** That contraction of the muscles of the neck can produce duskiness of face, lividity of lips, suffusion of the conjunctivæ, and some cerebral disturbance, was proved experimentally by myself by the aid of galvanism:†† but in many individuals there is no darkness of the face at the commencement of their attacks, and that which occurs subsequently is caused in a different manner. Trachelismus is, I think, of less importance and of less frequency than

* Neuro-pathology, p. 35.

† Traité de l'Épilepsie, ant. cit., p. 77.

‡ Leçons sur la Physiologie et la Pathologie du Système Nerveux.

§ Researches on Epilepsy, p. 61.

‖ Crichton, Delasiauve.

¶ An Inquiry regarding the Parts of the Nervous System which regulate the Contractions of the Arteries, Phil. Trans., Pt. II., 1858, p. 607.

** Essays, chiefly on the Theory of Paroxysmal Diseases of the Nervous System, p. 11. On the Neck as a Medical Region, p. 11 *et seq.*

†† Essay III., on the Neck, by Dr. Marshall Hall, p. 27.

Dr. Hall supposed;* but when occurring it affords further evidence of the condition and its locality, already described as the starting-point of epilepsy.

The effect of the muscular action, as described by Dr. Hall, is to compress the veins and retard the return of blood; but in order to do this the contraction must be "abnormal, irregular, spasmodic, violent, therefore, and without equipoise" "Normal muscular action does not produce" the obstruction.† That the veins are distended in the attack is obvious, and this may sometimes be traced to the spasms described. I have watched the effect of contraction in the platysma myoides on the external jugular; and the over-action of the omohyoid may be distinctly seen in the "posterior triangle" of the neck.‡ Dr. F. Hoffmann relates, moreover, the curious case of a patient in whom the compression of the veins during convulsion was especially visible; and after death the internal jugular vein "vom Muse. omo-hyoides zusammen gedrückt worden war." §

5. Dilated pupil is caused, in the manner already described, through the sympathetic nerve. Bernard states: "Si l'on *galvanise* le bout supérieur du grand sympathique divisé, tous les phénomènes qu'on avait vu se produire par la destruction de l'influence du grand sympathique changent de face et sont opposés. La pupille s'élargit d'active qu'elle était la circulation devient faible; la conjonctive, les narines, les oreilles qui étaient rouges pâlissent."‖ Mr. Augustus Waller was, I believe, the first to perform the converse of Bernard's experiment, and the dilatation of the pupil was so great as to imply that the dilating fibres were thrown into a state of energetic contraction."¶ Dilatation of the pupil is, then—like pallor,—the result of over-action, from undue stimulus: it is not the product of paralysis or diminished sensibility.

6. The radial pulse is weak or imperceptible; and this may

* See p. 63.

† On the Neck, &c., Essay I., p. 11.

‡ Essays by Dr. Marshall Hall, Chap. III., p. 44.

§ Allgem. Ztsch., f. Psch., 1859, XVI., p. 48, quoted in Schmidt's Jahrbücher, 103, 1859, p. 347.

‖ Comptes Rendus de la Société de Biologie, 1852. Leçons, ant. cit., Tome II., p. 499.

¶ Comptes Rendus, Tome XXXVI., p. 373.

be from the tonic spasm concealing it at the wrist, or arresting it at the shoulder, by the forcible throwing backwards of the arms. In the second manner it is perfectly easy—as any one may convince himself experimentally—to stop one, or the other, or both radial pulses. But the action of the heart may be arrested, and this by contraction of the chest-walls, as proved by Weber;* or by either reflex or direct action on its own nerves.† Lister has shown that while "gentle irritation of the vagus increases the heart's action, ... a slightly stronger application diminishes the force and frequency of its contractions."‡ Similar effects were found when galvanism was applied to the spinal cord at "about the fourth cervical and fifth dorsal spinous processes, . . . both vagi being divided in the neck;"§ and again, they were witnessed when, by an elaborate process, Lister had "eliminated the vagi completely."‖ "Hence," concludes the author, "it is clear that the sympathetic branches connecting the cord with the cardiac ganglia have equal claims with the vagi to be called 'inhibitory nerves.'"¶ Arrest, therefore, of both pulse and heart is the result not of inaction, but of either muscular over-action, or of augmented innervation.

That in some convulsions the heart may be acting vigorously while the radial pulse is almost imperceptible, I have observed not unfrequently; and this was rendered in one case especially evident by the presence of a loud cardiac murmur from malformation. A child æt. 12 months "when first seen by myself, at the Hospital for Sick Children, was in a fit. The pupils were excessively dilated; the radial pulse weak and almost imperceptible; the skin generally of deep leaden hue; there was a murmur, loud, harsh in quality, and systolic in rhythm over the whole cardiac region. Suddenly the pupils contracted, and at the same moment the radial pulse filled, and the child made an apparently voluntary movement of the head; but the murmur and the dark colour (here dependent on cyanosis) were persistent."** It is interesting to observe the

* Müller's Archiv., 1851, p. 88.
† Brown-Séquard's Researches, ant. cit., p. 78.
‡ Proceedings of the Royal Society of London, Vol. IX., No. 32, p. 374.
§ *Ibid.*, p. 375. ‖ *Ibid.*, p. 376. ¶ *Ibid.*, p. 378.
** Transactions of the Pathol. Soc. Lond., 1856-7, Vol. III., p. 124.

simultaneous relaxation of tonic spasm, in both the iris and some muscles affecting the artery of the arm; while the weak condition of the radial pulse, notwithstanding the continuance of the action of the heart, shows that the arrest of the former was due to causes acting locally, and not centrally, upon the circulation. We have further evidence of this mode of action in the violent throbbing of the carotid, to be frequently observed while the pulse at the wrist is reduced to a minimum.

In the *second* stage of an epileptic attack some symptoms are the same as in the first, but their causation differs.

1. Loss of consciousness persists; but it is not due to anæmia of the cerebral hemispheres. There is now venous congestion of the brain. Respiration has been arrested, and thus the return of blood from the cranium has been impeded; and this especially, as Flourens has shown, through the venous sinuses of the spinal column: for, "la compression du thorax produit une véritable injection de tous les vaisseaux veineux du cerveau;"* and this after every other source of communication between the two has been eliminated. Further, the blood is carbonized, and incapable of maintaining the cerebral functions. In the first stage the epileptic's brain had no action—now it has a morbid action; in the former it may be said to have been dead or defunct, in the latter to be poisoned or narcotized.

Reflex sensibility, or capacity, is not lost,† nor are the muscles irresponsive to galvanism. Hasse has found that those of the abdomen will react upon the application of this stimulus, while those of the extremities will not.‡ There are, moreover, all the evidences of exalted spinal activity; and these are due to the condition of the blood.

The old difficulty of accounting for the different conditions of activity in the cerebrum and in the spinal cord—sometimes got over by supposing the latter "régi par une force particulière antagoniste de celle du cerveau"§—is now removed. Loss of consciousness, in the first instance, is the result of tonic spasm; and, inasmuch as the quantity of cerebro-spinal fluid

* Recherches Expérimentales, ant. cit., p. 360.

† *Vide ante*, p. 105.

‡ Virchow's Handbuch der speciellen Pathologie, p. 254.

§ Miquel, Traité des Convulsions, p. 15.

eannot change suddenly in quantity, it is probable—Brown-Séquard urges—that when diminution of blood occurs in the brain proper, "there must be more in the basis of the encephalon and in the spinal cord." *

2. Clonic convulsion is the consequence of the circulation of carbonized blood; it is a phenomenon of asphyxia. It is not the result of a negation merely, viz., "the want of a due supply of arterial blood;"† it is due to the irritant, stimulant, or poisonous quality of venous blood. Absence of blood will, under certain circumstances, induce convulsions;‡ but during the second stage of epilepsy there is not this absence of that fluid. The real cause of the clonic spasm is that stated above, and which was inferred by Dr. Marshall Hall and others, but demonstrated with precision by Brown-Séquard.§ Venous blood is an irritant of the medulla oblongata, pons varolii, and tubercula quadrigemina.‖ The champing of the jaws and biting of the tongue are of this category; and Van der Kolk has shown that in those who bite the tongue "the irritation and vascular dilatation are more decided in the track of the hypoglossal nerve and corpora olivaria: in epilepties, on the other hand, who never bite the tongue, these changes are better marked in the course of the vagus."¶

3. The laborious respiration and tracheal gurgling are obvious effects of asphyxia primarily induced by tonic spasm. The venous blood, by its irritant effect upon the medulla oblongata, induces the increased violence of respiratory movements; the object of these being, as is evident, the decarbonization of the blood.

In the length of time during which the embarrassment of respiration lasts we have additional proof—to that given by the earlier phenomena of the attack—of the existence of that primary mischief already described as present in the medulla oblongata and spinalis. Brown-Séquard has shown that if two

* Researches on Epilepsy, ant. cit., p. 63.

† Radcliffe, Epilepsy and other Convulsive Affections, p. 161.

‡ Astley Cooper, Guy's Hosp. Rep., Vol. I., p. 36. Kussmaul and Tenner, op. cit. Syd. Soc. Trans.

§ Journal de la Physiologie, Tome I., p. 99.

‖ Researches on Epilepsy, p. 62.

¶ Op. cit., p. 240.

guinea-pigs—"one not having been submitted to any injury of the spinal cord, and the other having had this organ injured"—are prevented from breathing for two minutes, that "convulsions come on in both; but if we allow them to breathe again, the first one recovers almost at once, while the second continues to have violent convulsions for two or three minutes, and sometimes more."* It is to be inferred, therefore, that the condition of exalted irritability, which is the primary fact in epilepsy, renders the sufferer abnormally susceptible of the irritant influence of venous blood. Its importance, moreover, is increased, inasmuch as it not only occasions the attacks, but determines, by its degree of prevalence, the severity of some of its secondary phenomena.

4. Of the same nature as the laborious respiration is the palpitation of the heart and the throbbing of the arterial pulses. The tissue of the former is directly irritated by the poisoned blood;† and we may infer that it is also indirectly stimulated through the operation of the latter upon the spinal cord.‡

5. The state of the iris varies; its spasmodic dilatation ceases at the end of the tonic stage; its condition changes during the clonic. Commonly it is of moderate, or medium size; occasionally it oscillates from extreme contraction to marked enlargement: and these changes we must attribute partly to the condition of the tubercula quadrigemina, and partly to that of the sympathetic, at its junction with the cord.§ The contraction or dilatation would be determined, *cæteris paribus*, by the prevalence of irritant black blood in the former and the latter respectively.

Duskiness of the face and body generally is intelligible, without further comment.

6. It is during the clonic stage that the contents of bladder, rectum, and vesiculæ seminales are discharged; and that profuse lachrymation and salivation occur. These phenomena belong to one category. There is nothing to prove that there is any increase of secretion; the phenomena are due to pressure upon

* Researches, p. 5.

† Brown-Séquard, Researches, p. 62.

‡ *Vide* Lister's Letter in the Proceedings of the Royal Society of London.

§ Conf. Flourens' Recherches Expérimentales, op. cit., p. 47, with Bernard, Leçons, Tome II., p. 499. Waller and Budge, Comptes Rendus. Lister, Proceedings of the Royal Society of London.

the ducts.* In the tonic stage there is erection of the penis, and this in boys before puberty; I have noticed it, during convulsions, in young children. Seminal emission occurs at the moment of cessation of the tonic stage, and with the first clonic spasms, of which it forms a part.

The symptoms present during the *third* stage of an attack resolve themselves into those of the second, only modified by the partial return of sensation, perception, and volition. The elimination of carbonic acid from the blood removes the cause of symptoms, and the latter disappear. At first, sensation-movements take the place of simply reflex; and these, in their turn, give way to those of volition.

The after-stage of "stupor," when this exists, is one of exhaustion and partial paralysis. From observations on the pulse-respiration ratio, on the laborious character of the breathing, the stertor, and still dusky hue of the skin, with cool and moist surface, it would seem that there is deficient action on the part of the medulla oblongata. It is not easy to say which element in the attack determines the presence, persistence, or severity of the after-stage. Stupor does not follow seizures of "le petit mal;" it is not, therefore, a result of the mere paroxysmal interference with consciousness. It is not observed in many lunatics who are epileptic;† and, from repeated observation, I am convinced that it has no direct relation to the severity of the clonic convulsions. Lately I have seen a case in which the relation appears to be inverse. The patient, a young lady æt. 22, when much convulsed, is free from subsequent stupor; when little convulsed, she is oppressed and comatose for the whole day afterwards.

The condition is one of exhaustion, narcotism, and elimination; and its severity is, I think, in proportion to the amount of asphyxia, the latter being determined by the duration of the tonic stage of the attack.

The *epileptic aura* has been occasionally observed, from the

* Hasse, Virchow's Handbuch der speciellen Pathologie, ant. cit., p. 254. So also Peters, "Per motos hos extraordinarios vehementer comprimuntur glandulæ salivales, tonsillæ omnisque alæ ac particulæ secernentes minores oris et faucium. Exprimitur sic immanis abundantia muci atque salivæ."—Diss. Med. inaug. de Epilepsia, p. 6.

† See *ante*, p. 115.

time of Galen to our own: too great importance has been attached to it by many authors, and too little by some others. The term has been used vaguely, and employed to mean every kind of phenomenon which the patient recognised prior to the fit. It has been restricted, on the other hand, within narrow limits, and has been confounded with the earliest elements of the attack. Romberg speaks of a sensory and motor aura;* Herpin says that it is no other thing than "la première manifestation convulsive de l'attaque;"† Prichard had taken the same view, and had spoken of it as "convulsive tremor."‡ It is evident that these statements are not of universal application. The attack sometimes commences with initial cramps in the extremities;§ but from some of these true auræ differ, and certainly the term ought not always to be applied to the former.

The following positions may be regarded as established:— 1. That in the majority of cases aura does not exist; it is, therefore, not essential to the idea of epilepsy. 2. That in some cases its existence is an undoubted and constant fact; the aura, therefore, is in such instances closely associated with epilepsy. 3. That, since its presence is not essential, its occurrence must be regarded as a complication. This conclusion is warranted by the results of Brown-Séquard's experiments. Aura occurred in guinea-pigs whose spinal cords were injured; and who, in addition to the true epileptic phenomena, had a peculiar condition of some centripetal nerves induced by the injury which set up the epilepsy. Moreover, in these very cases attacks occurred sometimes without irritation of such kind as to induce the aura. 4. That the aura depends directly upon some peculiar condition induced in the periphery. Epileptics may pass through intense pain without suffering an attack. Thus I have seen tracheotomy performed in two cases, in which not only was the suffering severe, but the general shock considerable, and yet no attacks supervened during the operation. The irritation of dentition may cause convulsions even in an adult; but the fits have not followed, in the same individuals, the painful operation of tooth

* Manual, Vol. II., p. 197.
† Du Pronostic, &c., p. 420.
‡ Treatise on Diseases of the Nervous System, Part I., p. 88.
§ See Case V., p. 96; Case VII., p. 207.

extraction. Again, in Brown-Séquard's guinea-pigs, mere blowing upon one side of the face would bring on the paroxysms; whereas pinching the hyperæsthesic leg, and thus causing intense pain, would not induce the fit.* It is evident that sensation is not necessarily present in the aura. 5. That the irritation which leads to particular attacks must commence in the periphery; the latter alone has the power of originating auræ. Cauterisation, or destruction of the skin or mucous membrane, may arrest the attacks and cure the disease; whereas irritation of the divided nerve-trunk will not induce the paroxysm.† 6. That the peripheral condition, however, is sometimes induced through central changes — for example, in Brown-Séquard's experiments, and in the case related by Odier,‡ where an intracranial tumour existed as the cause of convulsions, which latter were preceded by an aura in the right hand, the arresting of which would stop the paroxysm. 7. That the aura is not subjective only, *i. e.* central, but mentally referred to the limb; or of the nature of sensations referred to the toes of an amputated leg; for its effects are arrested by ligature or division of the nerve-trunk. 8. That it may, however, be set up by local, or peripheral causes; such as tumours, injuries, &c. An example of this is seen in Case VII.§

The aura, then, must be regarded as a peculiar induced condition of the peripheric expansion of certain centripetal nerves, and this of the same nature as that which exists in the medulla oblongata and spinalis, viz. one of exalted impressibility or functional activity. When thus changed, these nerves are capable of setting up abnormal motor reactions upon the application of slight stimuli. In its essence epilepsy consists in preternaturally exalted activity of the reflex centre; reflexion involves (1) Impression from without; (2) A peripheral receptivity, capable of converting a mechanical, chemical, or other change into a nerve-impulse of centripetal direction; (3) A power of conducting this impulse by and in the nerve-trunk to the centre; (4) The faculty in the centre of receiving this impulse, of chang-

* Researches, ant. cit., p. 6.
† Brown-Séquard's Researches, p. 7.
‡ Manual de Méd. pratique, p. 180.
§ *Vide* p. 207.

ing it in direction and in kind, and of reflecting it upon a motor nerve as a motor impulse; (5) The property of merely conveying the impulse given, or of receiving that, whatever it may be, and at once changing it into a force that shall set up muscular contraction; and, (6) The function of contractility in the musele, in obedience to the motor nerve. In ordinary cases of epilepsy only the fourth of these, viz. the central function, is exalted; when sensory auræ exist, the second also is augmented in aetivity; there is undue receptivity and activity of the peripheral expansion; when the so-called motor auræ are present, it may be that the fifth element is in its turn over-active; so that certain groups of muscles respond to a stimulus, the force of which is not suffieient to eall other groups into action.

The so-called aura, which consists of muscular spasm, must, I think, at all events in some instances, be regarded as the commeneement of the attack. Thus Herpin thought,* and thus I have seen in the cases already detailed.† It may be, however, that prior to the museular movements there is an aura arising from the skin, or sensitive nerves of the muscles, and that the contractions of the latter are in response to its stimulation. This it is difficult to prove, but the supposition is warranted by the fact that in the artificially induced paroxysms of the guinea-pig spasmodic movements commence in muscles innervated from that portion of the centre, viz. the medulla oblongata, which receives the afferent nerves from the quarter in which the aura arises.‡

The interparoxysmal condition of the epileptic now requires consideration, and I shall endeavour to point out the mode in which its several phenomena are related to the central fact in the disease.

The *mental state* of the epileptic may be that of health, and it is found to be so in as many as 38 per cent.§ Mental failure is not, therefore, essential to the idea of epilepsy. It is common, however; but its different phases are encountered with varying degrees of frequency.

* Du Pronostic, ant. cit., p. 426.

† Cases V. and VII.

‡ Conf. Brown-Séquard's Researches, &c., p. 4; Van der Kolk on the Minute Structure and Functions, &c., p. 211.

§ See p. 43.

Loss, or impairment, of memory, is the most common change. Its character is this, that the individual, although capable of recalling some impressions,—and especially those received in periods long since passed,—is not able to remember the little events and circumstances of the day or the hour before. The failure resembles that of senile decay, accurately described by Dr. Prichard,* and thus interpreted,—"The disorder of mind consists, not in defective memory of the past, but in the incapacity for attention and for receiving the influence of present external agencies, which, in a different state of the cerebral organization, would have produced a stronger effect upon the sensorium or seat of sensation and perception."

But, as Dr. Laycock observes, "Attention is obviously an act of the will, whereby the instruments of knowledge are put into relation with the things to be known;"† and thus defective power of attention resolves itself into impaired volition.

But the epileptic, although defective in the manner described, may have a powerful will. He may, when he chooses, be decided, and that to the extreme of obstinacy; and yet his will is inoperative in the little affairs of daily life, and these make no impression upon him. An intelligent young authoress, recently become epileptic, has said to me, "Now, I often sit by the fire, or in the middle of the room for two or three hours together, feeling nothing, caring for nothing, thinking of nothing." Here is the secret of the failure, viz. the loss of motive or desire. This is not the place to discuss the nature of the will; I will simply quote from Mr. Herbert Spencer the following:—"That every one is at liberty to do what he desires to do (supposing there are no external hindrances), all admit; but that every one is at liberty to desire or not to desire, which is the real proposition involved in the dogma of free-will, is negatived as much by the internal perception of every one as by the contents of the preceding chapters."‡ In the epileptic here is the fault which results in defective "memory:" "desire" is too feeble to call into exercise the "voluntary" act of

* Art. "Insanity," Lib. Pract. Med., Vol. II., p. 108.

† Mind and Brain; or, the Correlations of Consciousness and Organization, Vol. II., p. 55.

‡ The Principles of Psychology, p. 617.

"attention;" and thus "impressions from without" are faintly registered and imperfectly remembered.

The further results of this defect are diminution of apprehension and of the reasoning faculty; and these may be regarded as the effects of the disease. The frequency with which certain psychical conditions coexist in experience is, other things being equal, the determining cause of the strength of their association, and thus of the degree of their practical utility. The epileptic too often does not use the faculties he still possesses, and thus the failures described result from the absence of their exercise.

The mode in which the mind becomes damaged in epilepsy may be gathered from the previous parts of this work.* That such result is not the mere consequence of the attacks is, I think, demonstrated by the facts I have already shown, viz., (1) That it does not depend upon the length of time during which the disease has lasted,† and that the former bears no constant relation to the latter; (2) That it is not determined nor regulated by the absolute number of seizures which have been endured;‡ (3) That it is not solely determined by the frequency of paroxysms;§ (4) That it is not in proportion to the severity of the attacks;‖ and, (5) That it does not depend upon their character; each and both forms of attack being found both with and without mental failure.¶

Again, mental failure is not dependent upon the state of the general health;** nor is it determined by age, sex, hereditary predisposition, or the nature of the first exciting cause.

It would seem, on the other hand, to depend upon a peculiar condition of the brain, induced (but only in some individuals) coetaneously with that which is the cause of the paroxysms. This we may infer from its early commencement in some cases, and its absence in others of long duration;†† and from the nature of its relation to the frequency of seizures; which is explicable on the hypothesis of the two, when coexistent, having a common cause, but inexplicable on that of their interdependence.‡‡

* See Chap. IV., Relations between Symptoms, p. 137 *et seq.*

† See p. 170. ‡ See p. 180. § See p. 181. ‖ See p. 185.

¶ See p. 186. ** See p. 178. †† See p. 172. ‡‡ See p. 186.

That the cause of mental failure is not identical with that which induces the attacks is evident from the perfect intellectual integrity of some who suffer severely from the paroxysms;* and also from the absence of all direct proportion between the degree of impairment and that of exalted motility.† That its cause is, however, closely associated with that of the attacks is to be inferred from the fact that the degree of failure does bear direct proportion to the frequency of the latter.‡ And we may further gather, that its relation is more close to that element in the causation of attacks which induces loss of consciousness, than to that which causes the convulsion; since it is with "le petit mal" that intellectual deterioration is associated more notably than with the violent paroxysms.§

The precise nature of the cerebral change upon which the mental failure depends we cannot positively describe; but the evidence from pathological anatomy is that the nutrition of the cerebral lobes does, in some epilepties, become impaired;‖ and the inference from symptoms would be to the same effect. This impairment, although not necessarily induced by the epileptic conditions, as I have just shown, is, however, in all probability, due to the changes which these induce upon nutrition through the vaso-motor nerves. The circulation in the brain proper is under the control of that portion of the reflective centre and its appendages in which epilepsy has its seat; and through changes in the latter the former becomes deranged. Anæmia of the brain is the essential phenomenon of "le petit mal;"¶ and this, followed by the toxic effect of venous blood, is also present in "le haut mal;"** yet persistent mental impairment does not result from these paroxysmal changes. But the conditions which cause these are to be regarded as the sources of that failure, operating slowly and progressively as the disease goes on; but in some instances commencing with its commencement, and in others producing most marked deterioration even before any paroxysmal phenomena have been observed.††

The phenomena to be discovered during the interparoxysmal

* See p. 186. † See p. 177. ‡ See p. 182. § See p. 191.

‖ Bouchet et Cazauvieilh, De l'Épilepsie considérée dans ses Rapports avec l'Aliénation Mentale.

¶ See p. 243. ** See p. 273. †† See p. 210.

period in the region of *motility* afford evidence which has been already discussed in regard of the primary or essential facts in epilepsy.*

The condition of the *general* health has been shown to be so various and so often unimpeachable, that positively no relation can be demonstrated to exist between it and the disease. It is absolutely good in the majority;† and when impaired its relations are such as to show that its deterioration is neither cause nor effect of the attacks; and further, that it determines neither the existence nor degree of mental incapacity.‡ All that does appear is, that the paroxysms are less frequent when the health and strength are impaired than when they are normal and robust,§ and that the mind is more frequently damaged in the physically strong than in the weak.‖

* See p. 249. † See p. 72. ‡ See p. 176. § See p. 158. ‖ See p. 177.

CHAPTER VI.

DIAGNOSIS.

"In our daily visits to the sick our first duty is to establish an accurate diagnosis. Diagnosis in these diseases is, unfortunately, not of the physical kind, as in diseases of the thorax, but the interpretation of symptoms. In this manner it is that the physiology of the nervous system and the diagnosis of its diseases meet and coalesce."—MARSHALL HALL.

TRUE epilepsy is to be distinguished from feigned convulsions, and from divers diseases. We have to establish its diagnosis from—

I. Simulated epilepsy.
II. Syncope.
III. Hysteria.
IV. Catalepsy.
V. Eccentric convulsions.
VI. Convulsions that are the expression of diathetic diseases.
VII. Organic lesions of the cerebral and spinal centres.

Some of these resemble epilepsy in many points, others in but few; and it is by an examination of the general clinical history of a case, rather than of its convulsive paroxysms, that the diagnosis may be established.

I. Epilepsy is less frequently SIMULATED now than it appears to have been in past times. The diagnosis depends upon the absence or presence of certain symptoms which cannot be feigned.

Choice of locality for falling is not to be depended on, as Georget* and others have insisted; for I have known epileptics who were able to exert this faculty; as, for example, a youth who could dismount from his saddle, tie his horse to a tree, get

* De la Physiologie du Système Nerveux, &c., Tome I., p. 347.

over a hedge and lie down on the other side, or go into a cottage to have his fits. I have known others who could walk out of one room into another, and lie down on a sofa. Similar facts are related by Portal.* Choice of locality does not prove that epilepsy is feigned; the absence of choice, on the other hand, is presumptive evidence that it is genuine; and this in proportion to the danger, or the privacy of the locality in which the fall occurs.

It has been said that if the thumbs are forcibly unbent they remain open in true epilepsy, whereas the simulator closes them again.† This test cannot be relied upon either way; but the manner in which the re-closure takes place might afford hints of insincerity.

Dr. Watson mentions the great strength of the true epileptic, his cool skin, and the short duration of the attacks as points likely to be feigned with difficulty or error.‡ But athletes can exert enormous force; the skin of the epileptic is not necessarily cool until asphyxia has occurred, and there is, as well, undue evaporation from its surface; and again the clonic stage of convulsions is sometimes of long duration, whereas a clever impostor might shorten the period of his performance. These characters, though not decisive, are, nevertheless, of use, in combination with others.

The dusky and pallid tint of skin cannot be assumed, nor can the condition of the pupil — "pupillæ semper dilatæ;"§ and upon the presence or absence of these the diagnosis may be established, with or without the aid of other corroborative proofs.

II. SYNCOPE could only be mistaken for attacks of "le petit mal," or *vice versâ*. There are not the clonic convulsive movements of epilepsia gravior.

The loss of consciousness is not absolute, nor is it so sudden in syncope as in epilepsy. Volition, rather than perception, is in abeyance; the patient feels, sees, hears, but cannot do anything; in extreme cases he "loses himself" altogether. But this

* Observations, p. 127.

† Marc. Épil. Simulée, Dict. de Sc. et Méd., Vol. XII., p. 542.

‡ Lectures, Vol. I., p. 644.

§ Millar, Dissertatio de Epilepsia, p. 4.

takes plaee, as a more or less gradual ehange; he feels "faint," and exhibits embarrassment of both respiration and eireulation. There is usually some immediate eause of the sensation, sueh as ehange of posture, &e.; and the horizontal position affords speedy relief.

The fainting patients slide downwards, and this with some gentleness; epilepties seem to be thrown down—"eum impetu prosternuntur."* Of syneope the sufferer retains some reeolleetion; of epilepsy, *i.e.* of "le petit mal," he usually has none; and the fatigue felt after the former is greater than that following the latter.†

III. Epileptie attaeks sometimes oeeur in those who are the subjeets of Hysteria, and there are to be witnessed paroxysms whieh partake of the features of both maladies. As a rule, however, they are distinet, and we have to point out the diagnosis of typieal eases of the two.

In the epileptie, during the interparoxysmal period, there are none of the speeial features of hysteria. The latter is more eommon in the female sex. It rarely eommenees earlier than the fifteenth year, or later than the thirtieth—although when onee established it may persist until a later period. It is more eommon in the unmarried, or eontinent; and in those of luxurious and lazy habits. It is frequently assoeiated with uterine irregularities, sueh as amenorrhœa, dysmenorrhœa, menorrhagia, &e.

The mental eondition differs from that of epilepsy. There is great want of belief in volitional power, leading to the assertion that this thing and the other eannot be done; and this, in eombination with exeess of emotion, produees most eharaeteristie features. The epileptie is more or less listless, eareless, indifferent, or stolid; the hysterieal patient, as a rule, exhibits the very reverse of these eonditions. Sensation and emotion are preternaturally aetive; every kind of pain is "agonizing," every trouble "overwhelming," every joy "exeessive;" and, under the influenee of these, various aetions may be performed whieh a few seeonds before were said and believed to be impos-

* Tatai, Hercules vere Cognitus, p. 53.

† Herpin, Du Pronostic, ant. cit., p. 148.

sible. Hysterical patients as frequently deceive themselves as others; but they are sometimes very clever in their attempts and practices upon their medical advisers and their friends. Ideation is often ungoverned and unduly active; producing a state of delirium, in which broken sentences, ejaculations, and extravagant expressions of suffering succeed one another with great rapidity. Sobbing, sighing, and laughing are common, and more or less uncontrollable; or there may be apparent coma, somnambulism, or extasis. It is much more rare to find hysterical patients dull, heavy, and impressionless; but this variety is occasionally to be encountered.

Sensation is always more or less notably changed. There is headache almost invariably present; and with this muscæ, tinnitus, epigastric constriction, globus, infra-mammary pain, and indeed every locality of the latter; sometimes simulating neuralgiæ, at other times articular affections. The special characters of hysteric pains are their exaggerated intensity, and their aggravation by causes which affect the mind rather than the locality; as, for example, slight irritation of the skin, rather than bending the joint, applying a deep pressure, or shaking the whole body.

Motility is excessive in relation to idea, emotion, sensation, and reflex stimulation, whereas voluntary movements are performed sluggishly and imperfectly. Starting, crying, coughing, &c., are common. The cough is dry and hard, and absent during sleep. When the involuntary movements resemble chorea, they may be distinguished by the possibility of their voluntary co-ordination.

The paroxysm resembles epilepsy, and sometimes closely, but it differs in essential particulars. The difference is not one only of degree, as it was said to be by Trotter;* neither is it to be determined, as Georget thought, by the relation of hysterical convulsion to pain;† nor solely by the nature of the spasm, which Hoffman says is tonic in epilepsy, clonic in hysteria.‡ The diagnosis is to be based upon a combination of features. The paroxysms follow hysteric prodromata: at their onset there

* A View of the Nervous Temperament, p. 149.

† De la Physiologie du Système Nerveux.

‡ Schmidt's Jahrbücher, 1859, Bd. 104, p. 133.

is constriction of the throat and epigastrium; there are plaintive cries, sobbings, or laughings, which reappear at the close; sensibility, perception, and volition are rarely, if ever, completely lost; the face undergoes little change; there is a twinkling movement of the eyelids; there is no marked dilatation of the pupil; there is rarely foaming, or bitten tongue; the attacks are of long duration; respiratory movements are disorderly, but there are no evidences of marked asphyxia; the pulse is small;* there is no stupor, but only general exhaustion after the attack; and although the paroxysms may recur for many years, and be followed by a peculiar kind of mania, they are rarely followed by dementia.

Paralyses of temporary duration occur more frequently after hysteric than epileptic seizures. In the former case electric irritability persists, and the stimulation by electricity rapidly removes the paralysis; whereas, when the symptom follows an epileptic paroxysm, it is commonly dependent upon some cerebral lesion, and is extremely difficult to cure.

Nausea, eructations, borborygmi, tympanitis, palpitation of heart, syncopal feelings, and frequent micturition of clear pale urine—sometimes spoken of as diagnostic signs of hysteria—have no value of that kind; for I have witnessed them all, and with as great frequency, after epileptic seizures.

IV. The features of Catalepsy are so peculiar that they cannot well be mistaken for epilepsy. Sometimes they accompany hysteria, sometimes they exist alone; they are as common in the male as the female sex. The true epileptic patient rarely exhibits this phenomenon; whereas it may be not unfrequently encountered in tubercular meningitis, or chronic softening of the brain.

The pathognomonic symptom is the persistence of the limbs in a state of balanced muscular contraction, so that they retain the position in which they were placed at the commencement of the attack. The limbs may be readily moved by the observer, but they retain the attitudes in which they are left; and these sometimes for hours, sometimes for days.

* Vermeule, "Pulsus in epilepticis major est quam in statu naturali, in hystericis contra."—De Epilepsia, p. 8.

Perception and volition are lost; the condition resembles that of "brown study;"* the circulation and respiration are uninterrupted.

V. Under the name of ECCENTRIC CONVULSIONS I place all those cases in which the attacks are evidently due to some cause operating upon the nervous system at its periphery; and which cause being removed, the paroxysms cease, and the disease is cured. An irritation acting upon the foot, the mucous membrane of the stomach or intestines, or kidney, upon the cerebral meninges, or the cerebral lobes, may induce convulsions, and eventually epilepsy. The mode of its doing so may be similar in each instance, viz. by the production of a condition of increased irritability in the reflective centre. This condition may be due solely to the operation of the supposed irritant; and, when so limited, I call the case one of "eccentric convulsions;" and the removal of the irritation will be followed by its cure. But the condition may become self-existent; the augmented irritability then depends upon a nutrition-change established in the reflective centre; and although the first source of irritation is removed, its results may persist in that nervous centre for months, for years, or for a lifetime. The case then is one of "epilepsy." The distinction is a real one, and of the highest importance in the direction of treatment.

Although the mode in which irritations induce convulsions may be the same, or similar, when they are located in the mucous membrane or in the brain, it is convenient to retain the term "eccentric" for such as the former, and to describe the latter under a different name, and this because the clinical histories of the two groups differ; the symptoms, besides the convulsions, being mainly outside the nervous system in the one, and modifications of its functions in the other. We have fever, dyspepsia, hæmaturia, &c., in the former; paralysis, anæsthesia, delirium, and the like, in the latter.

Eccentric convulsions may occur at any period of life, but they are most frequent during infancy and childhood. Barthez and Rilliet say, "Plus l'âge de l'enfant se rapprochera de la puberté plus il y aura de probabilité pour croire que les accès

* Laycock, Nervous Diseases of Women, p. 316.

convulsifs répétés suivis d'un retour complet à la santé sont des attaques d'épilepsie."* As distinguishing eclampsy from other convulsions, the child or adult has exhibited no signs of cerebral disease; there is no hereditary predisposition to tubercle; there is no diathetic malady present; there has been no exposure to infection.

The attack is immediately preceded or followed "d'un appareil de symptômes fébriles;"† or by distinct irritation or disease of (*a*) the gastro-intestinal organs; such as dentition, overloaded stomach, indigesta, ascarides, lumbrici, constipation, scybalæ, muco-enteritis, &c.: (*b*) the bronchio-pulmonary system; *e. g.* pertussis, pneumonia, croup, tonsillitis, diphtheria, &c.: (*c*) the genito-urinary organs; such as calculi in kidney or bladder, dysmenorrhœa, &c.: or (*d*) of the skin, nerve-trunks, or joints; erysipelas, wounds, bruises, rheumatism, and the like.

The paroxysm may resemble the epileptic in all essential features, and this so closely that there is nothing to distinguish the one from the other. More commonly, however, the invasion is less sudden,‡ and the paroxysm is of shorter duration. Perception and sensibility are rarely completely lost; and in the exceptional cases it is at the height of the attack, and not at its onset, that they are in abeyance.§ There is little or no stupor, there is no paralysis, and the attacks are rarely repeated.‖

In the adult, eccentric convulsions may recur many times upon the repetition of their exciting causes—indiscretions in diet, over-excitement of mind, or emotion, &c.;—but they are invariably to be traced to their source, and they may almost as invariably be relieved by judicious treatment. It is by their definite and constant relation to discoverable irritations, rather than by their paroxysmal features—although the latter are of value,—and by their ready amenability to treatment, that these cases differ from true epilepsy. I am not now speaking of isolated attacks of convulsion in the child, but of convulsions recurrent for many months or years in the adult, and commonly spoken

* Maladies des Enfants, Tome II., p. 273.

† Herpin, Du Pronostic, &c., p. 142.

‡ Brachet, Des Convulsions dans l'Enfance, p. 51.

§ Brachet, op. cit.

‖ Barthez et Rilliet, op. cit., Tome II., p. 270. Herpin, op. cit., p. 142.

of and treated as epilepsy, which nevertheless had not passed that line which separates the more serious idiopathic, self-existent disease, from the comparatively trifling, because externally dependent derangement.

I have notes of eleven cases of this character, three of which have been perfectly restored to health, and five greatly improved. Of the former group the following may be quoted as an example:—

CASE XIII.—*Male, æt.* 16. *Hereditary predisposition to nervous disease in collateral relationships. First attack from indigesta and emotional excitement; return of attacks due to similar causes, but not always. Mind, motility, and general health unimpaired. Recovery, after taking oxide of zinc, hyoscyamus, and alterative aperients.*

§ I. Male, æt. 16; height, five feet six inches. March, 1857.

§ II. A. Born in London; in good circumstances; living in healthy locality; very carefully brought up by parents. In the habit of taking much exercise, and of eating and drinking heartily.

B. Generally very good health. In June, 1856, had scarlet fever very mildly; no recognisable sequelæ at any time.

D. Father and mother living: no fits in line of direct descent. Father's brother had attacks; a cousin also suffered in the same way, became insane, and died. Father has morbus cordis, aortic regurgitation. Mother is very healthy. There is no gout, nor phthisis on either side.

§ III. A. On Shrove Tuesday, 1857, had been boating, ate heartily of pancakes, and in the evening went to the theatre.

B. While there was taken in a fit. Tongue was bitten, and on next day petechiæ were noticed on forehead, and he was very languid.

C. Last night, at nine o'clock, another fit. He screamed; the face darkened; respiration ceased; the neck swelled; he was completely unconscious; tongue was bitten; the bowels acted immediately after the attack; and subsequently he was drowsy.

He had eaten salt beef, and in the evening felt a little sick; but there were no other known prodromata.

March 14*th*, 1857.—§ IV. A. Fair complexioned, healthy looking, intelligent, active, cheerful, vigorous youth. Says he "feels quite well, but not so bright as usual." He has grown rapidly of late; feels chilly this morning.

B. There are petechiæ on forehead, and neck behind ears; skin elsewhere clear and healthy; never has chilblains.

D. Tongue large, moist, furred. Dentes sapientiæ not cut.

F. Pulse 96, soft, and regular.

H. Urine clear; no albumen.

K. No headache; memory good; "very excitable;" spirits rather above than below average.

M. Irides extremely sensitive and changeable: no myopia, nor tinnitus aurium.

§ V. E. ℞. Ext. taraxaci, ʒj. Inf. rhei., f. ʒj. Sodæ bicarb., ʒj. Tinct. hyoscyami, ♏xx.
M. Fiat haustus omni nocte sumendus.
℞. Zinci oxydi, gr. iv., bis die, formâ pulv. sumenda.

A. Rigidly digestible, but nutritious diet.

March 30*th*.—§ III. Last evening, *i. e.* on the sixteenth day from the prior attack, he was in "excellent spirits," and "appeared very well," but had an attack. The paroxysm was neither so long nor so severe as the one that preceded it. He was "dozy" afterwards, but there was no stupor. He did not bite his tongue.

§ IV. A. To-day feels "quite well."
B. No petechiæ.
K. "Very excitable."

§ V. E. Adde tinct. hyos., ♏v., sing. dos., misturæ.
Adde ext. hyos., gr. j., sing. dos., pilulæ.

April 15*th*.—§ III. Has felt quite well since last report.

§ IV. A. Quite well to-day; hands warm; feels "very jolly."

D. Tongue quite clean.

E. Lung-sounds normal.

F. Pulse good; heart-sounds normal.

K. No headache; no vertigo; no morbid sensations anywhere; no spasm; no rigor.

§ V. E. Habeat pil. zinci, ter quotidie.
Pt. mist. aper.

April 23*rd*.—§ III. Last night had attack (interval twenty-

five days). Tongue was bitten, but general convulsion mild. No warning; was playing cards when fit came on.

§ IV. A. Feels well; hands cool; a few petechiæ on forehead.

D. Appetite good; bowels open regularly.

F. Pulse 88.

H. Urine high-coloured.

K. No vertigo, cephalalgia, nor nausea.

§ V. E. Pt. pil. zinci oxydi, c. hyos.
℞. Ammon. sesquicarb., gr. iv.
Mist. camphoræ, f. ʒiss.
Pot. bicarb., ϑss.
M. Fiat haust. statim sumendus.

June 4th.—Well.

To diminish zinc, and continue aperient.

July 8th.—Well.

To take oxide of zinc once a day.

Pil. aloës c. sapone, gr. iij., every night.

December, 1858.—Has continued in perfect health.

This case is not included among those already analysed in this book, because I do not regard it as an example of epilepsy, but of eccentric convulsions (or, so-called "sympathetic epilepsy"). The attacks were at first traceable to distinct irritation of mucous membrane; and upon the removal of the irritation health was restored.

VI. Convulsions that are expressions of DIATHETIC DISEASES often resemble epilepsy very closely; at other times their diagnosis may be readily established by the recognition of the general dyscrasia upon which they depend. The difficulty is in proportion to the absence of other symptoms than those of the attack; in some cases it is great because the paroxysm may be the first indication of ill health, as every now and then occurs in uræmia.

In the child, convulsions not unfrequently occur at the onset of acute specific diseases, such as variola, rubeola, &c.; but it could rarely happen that such paroxysms should be confounded with epilepsy. In particular cases, however, it might be a question whether or no the convulsions were the commencement of epilepsy. That they were not, but were expressions of some

toxæmic condition, might be inferred if (*a*) the age was under six years, and the general and habitual health had been good, and there was no hereditary predisposition to tubercle, convulsions, epilepsy, or insanity: (*b*) no eccentric irritation were present:* (*c*) no signs of cerebral disease existed: (*d*) but there had been some slight malaise, loss of appetite, restlessness, feverishness: (*e*) together with exposure to infection, or the presence of a rash upon the child: (*f*) and if the convulsions which have occurred have been isolated, and of the character mentioned† as belonging to those of eccentric origin.

In the adult, convulsions do not occur at the onset of fevers; it is in the chronic condition of disturbance left by them that paroxysms are seen which sometimes resemble those of epilepsy. Urinæmia, chronic alcoholism, mercurial and lead-poisoning, icterus, and rheumatism afford examples of the kind of disturbance intended; but, besides these, there are cases of tubercle, syphilis, and scrofulosis, also of anæmia and chlorosis, during the progress of which convulsions may be witnessed, without there being any suspicion, in the latter two, of local structural change, and without there being any evidence of its existence in the former.

Urinæmia, as the concomitant of acute renal disease, or as the sequel of recognised scarlet fever, has a distinctive series of symptoms which it is not necessary to describe. When it occurs after typhoid fever, or cholera, and when it comes on during pregnancy, or the chronic development of Bright's disease, its first marked symptom may be convulsion, and that of epileptiform character. If, however, no other signs of the diathetic condition have been previously seen, they are almost invariably rapidly developed. On the part of the mind there is drowsiness, heaviness, listlessness, despondency, confusion of ideas, tendency to delirium: in the region of sensation, cephalalgia, amaurosis, tinnitus aurium, impairment of sensation in one limb, &c.; and in the motor system clonic contraction of the muscles, marked rigidity of the limbs, great irritability of the muscles to percussion, with feebleness and general sluggishness of movement.

After a convulsion, or sometimes without its occurrence, there

* See p. 289. † See p. 290.

is coma, and this of a peculiar character. It is apparently profound, for there is stertor, the mouth is open, the eyes are half-closed, and the pupils variable, but the patient may be readily aroused sufficiently to answer a question, and that correctly; he again, however, almost instantly relapses into stertorous sleep. This resembles the coma of opium poisoning; and of icterus;* it is very common in urinæmia, but is neither constant nor pathognomonic. The coma sometimes alternates with mild delirium;† the stertor is of high pitch, and appears to be caused in the mouth;‡ the pulse-respiration ratio is much altered, the number of respirations being diminished.§

But in the general symptoms, or in those outside the nervous system, there are the signs of renal disease, and by them the diagnosis is to be established. It is not necessary for me to describe them; sufficient has been said to show that urinæmic convulsions need not be mistaken for those of epilepsy.

The mode of diagnosticating urinæmia from epilepsy is typical of that pertaining to the group of toxæmic and diathetic convulsions. It is by the recognition of symptoms over and above those of the paroxysms; and these both in the nervous system and outside it.

Chronic alcoholism is but rarely attended by convulsions, and the latter still more rarely occur until after the symptoms of delirium tremens have been developed. These latter need not be carried to the extreme; but the threatenings are sufficiently characteristic.

In the previous history there are evidences that the poison has been taken, and in excess; and there are signs of its influences upon the digestive functions and the general health; such as feverishness, foul tongue, thirst, anorexia, reddened face, suffused conjunctivæ, loaded urine,‖ clammy perspiration, soft and frequent pulse.

The nervous system indicates its disturbance by dejection of mind, incapacity for mental exertion, restlessness, disturbed

* Andral, Clin. Méd., Tome IV., p. 262.
† Frerichs, Die Bright'sche Nierenkrankheit, p. 88.
‡ Addison, Guy's Hospital Reports, No. VI., 1859.
§ Marcé. *Vide* Schmidt's Jahrbücher, 1855, Nov., p. 167.
‖ Bence Jones, Med. Chir. Trans., Vol. XXXIV., p. 277.

sleep, and irritability of temper; præcordial oppression, nausea, and vertigo; by tremulousness of the limbs and tongue; and by loss of muscular power generally, with cramps in the extremities. These symptoms are especially noticed in the morning; and for weeks they may disappear daily as soon as the habitual stimulus is taken.

In the midst of these symptoms an attack of delirium tremens may occur, or there may be epileptiform convulsions. In the latter case there is no difficulty in recognising their cause.

Lead poisoning produces such varied disturbances in the nervous system that its diagnosis is impossible from them alone. Either at the time that convulsions occur, or in the previous history, may be found evidences of colica pictonum, and of paralysis. Duchenne asserts that the flexors of the fingers, the interossei, and the supinator longus are never affected with paralysis; and that those muscles which are involved present great diminution of contractility, and sensibility to faradization.* It is well known that they soon diminish in size; but Meyer states that their contractility is lessened before their nutrition is affected.† There is marked cachæmia; a blue line on the gums; and lead may be detected in the secretions, and in the skin.

Neither *icterus* nor *rheumatism* require special mention, their diagnosis from epilepsy being sufficiently easy by general symptoms. Convulsions may occur at the onset of rheumatic fever, and this before the joints have become affected; it is important, therefore, that the cardiac region should be examined, not as a means of diagnosticating the condition from epilepsy, but from certain other acute specific diseases.‡

As *anæmia* and *chlorosis* may occasion convulsions directly, although this rarely happens, so *tubercle, syphilis, scrofulosis,* and *rickets* may be supposed to operate, when they have produced no structural lesion in the nervous centres. The theory is that the reflex centre is involved with all the other organs of the body in some general nutrition-change, and that the expression of its participation therein is convulsion. It is,

* De l'Électrisation localisée, p. 507.

† Die Electricität in ihrer Anwendung auf prakt. Med. Abschn. VII. See p. 293.

however, infinitely rare for such condition to resemble epilepsy. As tubercle of the lung or scrofulous disease advances towards a fatal issue, there may be convulsions—just as there may be delirium or pain, — without any deposit of tubercle having occurred in the nervous centres; but, as I have already shown,* such phenomena are rare, and are not likely to cause errors in diagnosis. If there is evidence of central lesion, the case falls under the next category of diseases, and its diagnosis will be found in the succeeding section.

I have enumerated this group of possible cases because it is commonly believed to exist; whereas, the progress of investigation will, I think, show that it may be resolved into either simple epilepsy—*i. e.* epilepsy without any evidence of special cachexia,—eccentric irritation, or developed diathetic disease of the nervous centres or their meninges.

VII. The *organic diseases of the nervous centres and their meninges* which may be confounded with epilepsy are the following:—

Tumour; tuberculous, carcinomatous, &c.; aneurismal, fibroid hydatid.

Meningitis, chronic; either simple,—traumatic, from disease of bones, &c.; or specific,—syphilitic, tubercular, chronic hydrocephalus, &c.

Softening of the brain, chronic.

Hypertrophy of the brain.

My object is to describe the diagnosis of these several maladies, not from one another, but from epilepsy. The mode of distinguishing them among themselves I have detailed, as far as was at the time possible, in another work.†

Regarding them for a time as forming one large group, it may be said first, that epilepsy is to be distinguished from organic disease of the brain by the absence of symptoms of the latter. I have already shown that in the epileptic there may be, apart from his paroxysms, perfect integrity of mind and of body; that there need not be in him either ache or pain, either

* See Chap. V., p. 255.

† Diagnosis of Diseases of the Brain, Spinal Cord, Nerves, and their Meninges, p. 168 *et seq.*

paralysis or spasm. Whatever, then, is found beyond the attacks themselves is a hint that something more than simple epilepsy exists. But in about half of the epileptics examined by myself there was something wrong, either in regard of mind, sensation, motility, or general health; and yet there was not in any one of these evidence of any recognisable organic disease. If there had been, such cases would have been excluded from the category of simple epilepsy; and all those cases, in which I had reason to believe that there was present either tumour, meningitis, or softening, were removed. The preceding analysis of symptoms has been furnished in order to show in what way, beyond his paroxysms, the epileptic may suffer. We have seen that memory may become defective, apprehension and ideation impaired; that there may be tremor, or spasm, either clonic or tonic; that there may be headache, vertigo, and tinnitus aurium; that the general health may be damaged, and nutrition and strength diminished. These things may occur, and yet there shall be nothing to show that the case is more than simple epilepsy. But we have not found delirium, except as a complication, nor has there been anæsthesia, nor paralysis; nor, indeed, any definite symptom or indication of persistent injury to the nervous centres; except that which often occurs as a complication,* viz. generally impaired nutrition of the cerebral lobes. The principal fact, then, is that where conspicuous and persistent changes in the functions of the nervous system occur during the interparoxsymal period, we may infer the existence of structural disease.

Another fact of importance in the diagnosis of the entire group of organic diseases is their presentation of more considerable changes in the general health than do cases of epilepsy. It has been already shown that in the majority of epileptics there is sound physical health;† whereas the victims of carcinomatous or tubercular tumour, of meningitis, either simple or specific, and of chronic softening, exhibit more or less marked impairment in this direction; there are cachexia, hectic, emaciation, digestive derangements, and the like.

A third fact is that the general clinical history of epilepsy is

* See p. 282. † See p. 72.

in the main one of very slow progress: that its victims frequently continue for a long time in the same condition; that when once developed there are but rarely long intermissions in the symptoms; and that the latter, when recurring, present month after month, and year after year, the same phenomena, *i.e.* without change in either severity or character. On the other hand, the chronic structural diseases are of more speedy progress; and their symptoms advance in intensity and complication; yet, sometimes, they may be interrupted for lengthened periods; and, as the case advances, the symptoms may change, sometimes one group giving place to another entirely different, at other times those which are more or less persistent in essentials undergoing variations in both character and intensity.

Premising so much in regard of the whole group of organic diseases, it is sufficient for my present purpose to indicate the main features of their differential diagnosis; that is, of their recognition *inter se*. This process resembles that applied to diseases of other organs: there are no symptoms pathognomonic of either one or the other lesion; cases of each may present every morbid phenomenon; and it is only by the relation that these bear to one another, by their mode of development, and the general clinical history of the particular case, that the diagnosis may be established.

There are four kinds of disease of the chest, such as phthisis, pleurisy, bronchitis, and mediastinal tumour, each of which may present cough, dyspnœa, pain, expectoration, and constitutional disturbance, and yet it shall be possible—and without the aid of "physical signs"—to diagnosticate not only these diseases from spasmodic asthma, but from one another, and that by a simple comparison of the phenomena enumerated, and which are common to them all. Allow that sometimes diagnosis is impossible, and we have a state of practical science precisely similar to that which pertains in regard of diseases of the brain.

Returning to those with which we are at present concerned, it may be said broadly of the four different kinds enumerated, viz. tumour, chronic softening, chronic meningitis, and hypertrophy of the brain with chronic hydrocephalus, that the predominant feature in the first is pain, in the second impairment

of function, in the third combination of equally increased and diminished activity, in the fourth physical change.

Tumour might be inferred to exist if in a certain case we found violent, paroxysmal, limited cephalalgia; with loss or imperfection of vision; without motor paralysis, or with partial and local paralyses slowly developing. "If," says Durand Fardel, "there are joined to these, epileptiform convulsions, without paralysis in their intervals, the probability of tumour is still greater; and this is especially the case if intelligence and articulation remain intact."*

Chronic softening may be diagnosticated by the gradual failure of mind, of sensibility, and muscular power; and these in combination with oppressive, not intense, headache; and hemiplegia, or general paralysis, incomplete in degree, and accompanied by rigidity.

In chronic meningitis there are the following combinations:—Irritability of temper, and occasional delirium with loss of memory and impaired intellectual power; clonic or tonic spasm of some muscles or groups of muscles, alternating with, or occupying different localities from, but existing at the same time with, paralyses of limited extent and imperfect development; pain in the head, and occasional intolerance of sensorial impressions, with local anæsthesiæ, or impaired senses of sight, hearing, &c. Pain in head is commonly not very severe, nor is it narrowly limited in locality.

When hypertrophy of the brain or chronic hydrocephalus are either of them present, the enlargement of the head is diagnostic. In the former it commences at the occiput, and differs in appearance from the latter by the absence of those changes in the orbital plates and position of the eyeball which are peculiar to accumulation of fluid. In the latter there is prominence of the fontanelle, in the former there is its depression; and a similar change is sometimes "observable at all the sutures."†

By these features the four groups of organic diseases may be diagnosticated with approximation to certainty; but there are additional symptoms presented by some subdivisions of each

* Traité des Maladies des Vieillards, p. 144.

† Dr. West, Lectures on Diseases of Infancy and Childhood, p. 97.

group; and these, when present, render great assistance to the physician.

Tumour, for example, may be of such nature that it occasions no special morbid phenomena; but, on the other hand, the nature of the growth may be such as to produce characteristic symptoms of a cachexia, the presence of which tells back again upon the diagnosis of tumour. Thus, the existence of the tuberculous or carcinomatous cachexia, or the recognition of arterial or cardiac disease, might lend probability to the diagnosis of a tubercular deposit, a cancerous, or aneurismal growth. Again, the presence of the syphilitic dyscrasia, or, *à fortiori*, of syphilitic disease of the bones of the head; of chronic rheumatism or gout; or the existence of injury to, or local disorganization of bones, without specific malady, would point to the probability of slow meningitis being the cause of symptoms. Lastly, the absence of these specific characters, and the presence of general mal-nutrition, of arcus senilis, of feeble heart, and rigid arteries, would indicate the likelihood of chronic softening.

Epilepsy may commence at any age, but the period of puberty is by far the most common; whereas, carcinoma and arterial disease—and, therefore, malignant tumour, aneurismal enlargement, and chronic softening—are usually much later in their development. Similar considerations will render assistance in the diagnosis of tubercle, syphilis, and the like. It is not necessary to point out the various combinations which may occur, as they are very numerous, and their diagnostic value may be readily appreciated in particular cases. If led by the interparoxysmal symptoms towards a diagnosis of some organic disease of the nervous centres as the cause of convulsive phenomena, we may find, in the latter, further evidences that the affection is not simple epilepsy. The natural history of epilepsy has been already described. I have now simply to show wherein the groups of organic diseases differ therefrom.

There is extreme irregularity in the period of recurrence of convulsions symptomatic of cerebral disease. Their appearance is preceded and accompanied by aggravation of the other symptoms, and often followed by the development of new phenomena. The attacks have rarely all the characters of fully developed epileptic paroxysms; either consciousness is partially retained;

or there are no asphyxial changes; or the irregular spasms continue for a much longer period; or they are confined within narrow limits; or they are not followed by coma.

By these means the diagnosis of epilepsy from structural diseases may, I believe, be not only attempted, but in the majority of cases accomplished; and thus the most important aid be furnished to the practitioner in advancing towards that end which it is the object of scientific medicine to attain, viz. the successful treatment of disease.

The following is an illustration of epileptiform convulsions attendant upon intracranial disease:—

Case XIV.—*Male, æt.* 40; *received a blow on the head, followed by "deadness," local paralysis, epileptiform convulsions, maniacal excitement, and general paralysis. Recovery under mercurial treatment. Convulsive seizures returned for a time, and again ceased; then reappeared, together with various changes of motility and sensation, which ultimately yielded to treatment. Health now good for four years.*

§ I. G. H., Englishman; male, æt. 40, when present history commences; height, 5 feet 7 inches.

Measurements:—From acromion to acromion, 17 inches. Head, circular, 22 inches; across vertex, from ear to ear, 12 inches; from nose to occip. protub., 13 inches; transverse with callipers, over ears, 6 inches; longitudinal ditto, 7⅝ inches. Neck, at cricoid cartilage, 14 inches; at ensif. cart. circumf., 32½ inches.

Limbs well formed and symmetrical; weight before illness, about 11 stone; patient right-handed.

Before illness, very great muscular strength; and same was true of father and brothers.

Education good for position in life; expresses himself with great ease and propriety; fond of reading; of somewhat excitable and irritable temper, but sanguine in temperament and cheerful in manner.

§ II. *Previous History.*

A. Has been in London for many years; born in Hertfordshire.

Now resides in the neighbourhood of the Mile-end-road, occupying a respectable house, which is partly let to two lodgers.

Has been a letter carrier in the General Post Office for eighteen years; before that a baker. Has to be in Post Office at 5 A.M., throughout the year, and habitually walks to office. Sorts and stamps letters until 8, and then delivers them along portion of the Mile-end-road. Has four or five hours' rest in middle of day, and takes a nap; then returns to the office between 4 and 5, and remains until 8; after which walks home again, distance $2\frac{3}{4}$ miles. Office is lighted with gas during day, as room in which he works is otherwise dark. Work is hurrying and anxious; everything is done, as he says, "against time."

He has always lived well; has had good appetite, and plenty to eat. Takes two or three glasses of beer daily, and sometimes a little gin at night; but has not done this of late.

Clothing ample. He is remarkably clean and neat in his person, and appears much above his station in life.

Sleeps generally $1\frac{1}{2}$ to 2 hours in day, and 4 hours at night; before he went into Post Office had less sleep, and very irregularly.

B. General health was satisfactory until September, 1850, when he was 40 years of age. Never had any serious illness.

C. Married, but has no family. Married twenty-seven years.

D. Parents both dead. Father choked from effects of fish-bone lodged in throat: healthy man. Mother died imbecile, at great age: had no fits. Had two brothers; one died, like father, from effects of fish-bone in throat; the other brother died suddenly two years ago, having suffered many years from rheumatic gout, with thickened joints. Four sisters living in good health. One sister died of "apoplexy" four years ago.

§ III. A. Could not refer illness to any change in mode of life.

B. In September, 1850, after receiving a violent blow on the head, was seized with deadness in the fingers of the right hand, so that he could not hold anything. There was no pain, nor was there any other symptom; but the deadness gradually extended up the arm, and deprived him of its use.

C. G. H. was at this time for two months in the London Hospital, and was there galvanized for the paralysis. Towards the

end of October involuntary movements, shaking or "agitation" of the right hand and arm commenced; this rapidly extended to the left side, and was followed by an epileptiform convulsion, which lasted twenty minutes.

After the fit had passed away he recovered, and felt pretty well until November, when he had another fit, much more violent than the first, and of longer duration, lasting for twenty-eight hours. After this he became maniacal, and required several men to hold him down; but he gradually became quieter towards the evening of the third day; appeared then prostrated in physical strength, had lost the use of all his limbs, and was apparently "idiotic."

In this perfectly helpless condition he continued until January, 1851, when he came under the care of Dr. Marshall Hall, who at once administered mercury. In the course of a fortnight his mental faculties improved, and the use of the limbs gradually returned. He was kept slightly salivated throughout the summer, and in September, 1851, resumed his duties in the Post Office.

In March, 1852, after an indigestible meal, he had another epileptiform attack, but almost immediately resumed his work.

G. H. was first seen by myself in January, 1853, and he appeared then in good health, and was in full employment at the Office.

In the summer of 1854 he again suffered two epileptiform attacks, which he could not refer to any occasional cause, and from which he fully recovered in the course of a few days.

On November 15th, 1854, he noticed a tingling sensation in the fingers of the left hand, but there was no other symptom; on the 16th the fingers "set themselves" in various strange positions, and then jerking movements followed in the left wrist and forearm. This setting and jerking of the fingers occurred several times in the hour, and lasted for two or three minutes at a time. There was nothing else that he could notice, and he felt otherwise quite well.

§ IV. A. Is generally well nourished, and appearance is that of health and strength. His walk is a little formal, and sometimes staggering—the attempt to correct which gives it the formal character.

Expression of countenance anxious.

K. Every three or four minutes the fingers of the left hand become suddenly rigid, some of them extended and others flexed; but the same fingers do not constantly observe the same positions; in fact, every variety of distortion occurs. The rigidity lasts for a few seconds—from five to thirty,—and sometimes disappears again without anything further; but more commonly it is succeeded by clonic movements of the fingers; they open and shut alternately, then the hand moves backwards and forwards upon the wrist, and this is followed by alternate flexion and extension of the forearm.

These movements cannot be controlled by the will, and the attempt to do anything with the fingers immediately produces them. It takes him an immense time to get on a large knitted glove. Not the slightest pain accompanies the rigidity or jerking; but he is conscious of the movement when not looking at the hand. He says he feels, however, as if the left side of the face and neck moved in the same manner, but nothing can be seen there. His left foot occasionally jerks, but this he does not appear to notice. The tongue deviates to the left. His mental condition appears natural.

§ V. E. ℞. Pil. hydrargyri, gr. iss.
Ext. hyoscyami, gr. j.
M. Pro pilula ter die sumenda.

November 20th.—§ IV. K. Movements less violent, and face less anxious in expression; he can do more with the hand voluntarily.

November 24th.—§ III. C. On the night of the 20th was in apparently same state as when reported. Went to bed at twelve, and, at half-past one, had a violent epileptiform fit. He was unconscious for ten minutes, and was violently convulsed; the left side more so than the right. He bit his tongue; he became stertorous, but after a little time appeared to feel that his mouth was sore; said nothing, but turned on his side and went to sleep. At three o'clock the same morning another fit occurred, and his body arched over towards the left side; there was violent palpitation of the heart. The next day, the 21st, he slept almost all the day, but in the evening came down stairs. His arm jerked violently in the evening.

§ IV. Now (A.) he feels better; face has its natural expression.

D. Tongue covered with dirty-yellowish fur; bowels open.

F. Pulse (standing) 108; small, soft, regular.

K. Can use his left hand pretty well between the attacks of jerking. They are much less frequent than they were. Power of left hand much less than of right, and sensibility much diminished. He feels drawing and dragging of left side of neck and face, but there is no spasmodic movement to be seen. He has no headache, but feels a little chilly.

§ V. D. Emplast. cantharidis nuchæ.
E. Pergat in usu pil. hydrarg. et hyoscyami.

December 15*th*.—§ III. C. The jerking movements gradually disappeared, and have not occurred for some days. (See K, § IV.)

§ IV. F. Pulse 80.

K. No headache, but he feels a "creeping sensation" in the muscles of the left arm, "as if they were all alive;" and occasionally the fingers draw up, and close tightly upon the palm. He grasps well with the left hand, but when not looking at objects lets them fall out of his hand occasionally. He can, however, walk well with his eyes shut. He feels giddy if he turns his head round to look at anything at his side. Tongue deviates to the left, and his grasp with the left hand is less firm than with the right.

The sensibility of the left hand is diminished to pinching, and as tested with the compass-points on the back of the hand is only half as acute as that on the right; *i. e.* he recognises the double contact at half-inch with the right, but not until the interval is more than an inch with the left. The tips of the fingers in front are equally sensitive on the two hands.

January 11*th*, 1855.—§ III. C. Has been gradually improving, and now (§ IV. A) feels quite well, and wishes to resume work. This he did, but was prevented from continuing by a furuncular swelling in the right axilla.

§ V. Omit. med.

June 27*th*.—§ III. C. Has been at work for five months,

and has appeared in perfect health; but wife says that he is very irritable in temper, and has been taking too much beer, and occasionally neat spirits. He was cautioned about this a fortnight ago, and since discontinuing the gin has felt quite well until this morning, when, between eight and ten, he was run over and knocked down while on duty. The head of the horse of a parcels' delivery cart struck him on the left side of chest, and threw him several yards back upon the pavement, against which he struck his head just at the right parietal eminence. He was stunned for a few minutes, and could not tell for some little time where he was. At eleven o'clock he came to my house.

§ IV. A. Appears irritable and uneasy. (See K.) Has shivered.

B. Surface generally, and also of head, cool. Integuments thickened over right parietal eminence, and a few spots of blood visible beneath cuticle, but skin not broken.

D. Tongue covered with white fur, and dry. Has not vomited.

F. Pulse small, weak, and unfrequent.

K. Has much pain in right half of head, especially postero-laterally. Complains of heavy rumbling noise in both ears. Feels in his throat as if "the windpipe was stopped, and very tight." In the left arm, and left side generally, has "queer feeling and tingling." Says he can feel pinch on left hand as plain as on right, but that it "runs all up" the left arm. Legs feel trembling and chilly. No nausea. Sight natural.

Features are not symmetrical, and are drawn to right side. Tongue deviates to left. He squeezes feebly with both hands; but left is weaker than right. There is no dragging of leg in walking; no clonic spasm.

Mentally he feels and appears much confused; but still answers questions accurately. He is loquacious, and very irritable in his manner; but between sentences droops his eyelids, and several times seems for a moment to lose himself. Wife says he was fast asleep in the omnibus coming to my house.

M. Pupils equal, of usual apparent size: no strabismus.

§ V. C. Hirudines vj. temp. dext.
E. ℞. Magnes. carbonatis, gr. xv.
Potassæ bicarb., gr. xx.
Ammon. sesquicarb., gr. ij.
Aquæ ad. f. ʒiss. M. pro haust. secund. horis sumendo.

August 30th.—§ III. C. In accordance with my advice G. H. abstained from his work for nearly a fortnight, but at the end of that time, feeling quite well, it was resumed.

Since the 16th of this month he has suffered from weight in the head, and over the eyes; drumming noises in the left ear, mistiness of vision, and vertigo, especially when moving his head. There have been twitching movements in the left arm and forearm; and occasionally in the left leg. He has been mentally confused and drowsy, but has had no distinct pain in the head, no loss of appetite, nor general malaise.

§ IV. K. Tongue deviates to left. Movements generally are sluggish, and he holds arm to side, and says it feels useless.

§ V. E. ℞. Pulv. rhei, magnes. carb. aa. ʒj. Aquæ f. ʒiss.
Fiat haust. omni nocte sumendus.
℞. Pil. hydrarg., gr. j., bis die.

September 2nd.—§ IV. K. Complains of pain, and weight in the head, and a hot feeling up the left side of the neck and head. Sensation is deficient in left hand and forearm. Sight is defective. (See M.)

He often bites his tongue when eating or talking; the tongue deviates to the left. He lets small objects drop out of left hand when not attending to them. Occasionally his left foot is suddenly drawn off the ground by flexion at knee-joint. This occurs while walking, and has nearly thrown him down several times. His arm is tremulous.

Mental state appears natural, with exception of a little depression of spirits. He is drowsy during day, and sleeps very heavily at night.

M. He hears well, but the sight is defective, and this is especially the case with the left eye. He frequently passes by objects on his left side without seeing them, and has thus gone past the door of his own house. Pupils are equal, and of medium size. No photophobia.

§ V. E. Pergat. in usu medicament.

September 9th.—§ IV. K. Has gradually improved, and now presents nothing abnormal except the deviation of the tongue, which persists, and is constant to the left side.

May 18th, 1857.—(Eight months after last report.)

§ III. C. Has continued well and at his work until almost the present time, but about three weeks ago "lost himself" for a few minutes while riding in the Post-office Van, and thinks he had a slight fit. Ever since that has noticed one or more of the following symptoms.

§ IV. D. Appetite good, but thirst much greater than usual. Tongue covered with dirty creamy fur. Bowels regular.

K. He has frontal headache, and occasional vertigo; the latter is always of the same character, viz. the feeling of floating backwards, and towards the right. He does not see any apparent motion in external objects, and most common cause of vertigo is turning head round, especially towards the left side to see objects which sometimes escape him if he does not turn the head. The left arm feels numb; but the leg does not. He has curious sensations in the left foot, however, which he thus describes:—"Often when I am walking I feel as if some blood-vessel gave way, and that my boot gradually got full of blood; but when I take the boot off I can see nothing the matter. Often of an evening or morning, when walking across the room without my shoes, I feel as if I was treading upon a nail in the carpet or somewhere; but when I have taken to look for it, the deuce of a nail is there there." (See § III. C.)

Motility.—If he places his left arm down at the side—and this he can do quite easily, for there is no rigidity of any joint,—it gradually and quite involuntarily ascends; the fingers flex upon the palm, the hand is bent upon the forearm, the forearm flexes, and the whole arm is carried across the chest. The fingers sometimes press so firmly into the palm of the hand without his being aware of it that he indents the skin deeply. Muscles of the fingers and hand twitch sometimes, and he often lets objects drop. Tongue deviates to left side.

Intellect apparently natural, but I hear from his wife that he has "a sort of madness for betting upon horses," and that he is

taken in very easily by the sharpers inhabiting the East end. This she says is quite a new thing, and he is very clever in trying to keep it from herself, and excessively ill-tempered (also a new thing) if she lets him know that she is acquainted with his misdemeanours. From several incidents his wife communicated to me, it appeared that G. H. was upon this point quite bereft of his ordinary intelligence; and that although naturally (*i. e.* formerly, for many years) he was disposed to be very careful of money, and very economical, and had managed to save nearly £200, he was now utterly befooled about horses, and would risk anything upon any chance, when recommended to do so even by a perfect stranger.

§ V. E. ℞. Hydr. iodidi, gr. j.
Fiat pil. bis die sumenda.

May 23*rd.*—§ IV. D. Tongue still covered with dirty fur; bowels open, and appetite good.

K. Feels much the same. Hand does not draw up quite so much as it did; but he constantly lets objects fall. Last night in Post Office felt very faint, and had to give up his work.

§ V. E. ℞. Potassæ bicarb., ℈j. Ammon. sesquicarb., gr. v.
Mist. camph. f. ℥iss. M. pro haustu, t. d. sumendo.

May 26*th.*—§ IV. F. Pulse, 68.

K. Has none of the abnormal sensations in feet or hands. Sensibility equal on the two sides. Headache persists.

There has been no drawing up of arm for two days; he has not dropped objects, and the hand "feels warm and comfortable."

He lost some money last night by betting, and was very much excited about it, and this morning has a wild and vacant look.

June 4*th.*—D. Tongue brownish fur; appetite bad; bowels much open.

F. Pulse 60, regular.

K. Complains that head is full of pain and confusion, but not more in one spot than another. No abnormal sensations in arms or legs.

Says that he cannot "keep his perpendicular in walking," and constantly thinks that he shall fall.

§ V. E. ℞. Hydr. c. creta, gr. j. Ext. hyos., gr. j. bis die.
℞. Infusi gent. co. f. ʒiss. Ammon. sesquicarb., gr. iv. bis die.

Since this date I have seen G. H. several times, and he remains quite well. The only symptom persisting is slight deviation of the tip of the tongue to the left side. Occasionally he suffers from vertigo, or headache, or numbness in the arm; but these symptoms have always yielded immediately to alterative medicines. His wife died about three years ago; and not long afterwards he was removed from the Post Office. He had much anxiety about his affairs at that time, but it did not induce any serious disturbance of his health. Twelve months ago his house was burned down; and shortly after this catastrophe he married a second time. Neither of these events have injured him; and he is now, with the exception mentioned, in perfect health.

I have regarded the case as an example of occasionally recurrent meningitis. The relief of symptoms by mercurial treatment has been a noteworthy fact upon many occasions.

CHAPTER VII.

PROGNOSIS.

"J'en ai guéri un très grand nombre."—TISSOT.

"Elle conduit presque infailliblement à l'incurabilité par de lentes dégradations."—DELASIAUVE.

THE prognosis of epilepsy in the present day is, it would seem, less favourable than was that of the last century; and the reasons for this are, or may be, threefold. The disease may be essentially less tractable; the physician may be less readily convinced of cure; and the term may sometimes include more or less than it does at other times.

Of 115 cases of chronic convulsive disease which have fallen under my own care, all of which more or less closely resembled epilepsy—many of which had been termed epilepsy, and had been treated as such for several years,—there were 21 individuals who perfectly recovered, *i. e.* 18 per cent. Of these 115 cases there were 81 examples of true epilepsy; but of the epileptics only 8 absolutely recovered, equalling only 10 per cent. Of the cases not truly epileptic, there were 23 which belonged to the category of organic cerebral disease, or so-called "symptomatic epilepsy;" of these 10 were cured, 7 ameliorated, 4 were lost sight of, and 2 remained in *statu quo*. In 43 per cent., therefore, of so-called "symptomatic epilepsy," a cure was effected.

There were, moreover, 11 examples of excentric irritation, or of so-called "sympathetic epilepsy;" and of these 3 were cured, or 27 per cent.; and 5 individuals, or 45 per cent., were greatly improved.

Among epileptics almost every case was more or less improved for a time, and in some instances the amendment was considerably prolonged. I have only regarded those cases as "cured," in which there has been perfect restoration to health which has lasted for at least four years; at most for nearly eight.

These results of treatment in convulsive diseases generally, have been furnished in order to show wherein difficulty is to be expected; and in order further to remove the impression that might be given by the naked facts of simple epilepsy, in relation to treatment, viz. that very little is to be effected by the latter.

I do not now deal with the prognosis of so-called "symptomatic epilepsy," *i. e.* of convulsions dependent upon organic disease of the nervous centres, such as tumour, meningitis, and the like; nor with that of the so-called "sympathetic epilepsy," *i. e.* of convulsive affections clearly connected with eccentric irritations,—the renal, uterine, gastric epilepsy, and so forth: it is with the future of simple, true, or, as it has been called, "idiopathic epilepsy," that we have to do. This subject will be considered conveniently under three heads: 1st, the prognosis of epilepsy generally, *i. e.* as to the probability of cure, amelioration, or the reverse of the disease as a whole; 2ndly, that of the mental condition of the epileptic; and, 3rdly, that of the danger of individual attacks.

I. The prognosis of epilepsy generally depends upon many considerations. The *cause* of the disease is thought to exercise a great influence upon its career. According to Georget,* Delasiauve† and others, the disease is especially rebellious when either hereditary or connate. Upon this point Herpin‡ is of a different opinion; and my own observation would lead me to agree with him, for I have known some instances of cure among cases of distinctly hereditary epilepsy. Zimmerman, quoted by Esquirol,§ and Georget,‖ state that when masturbation is the cause, the case is almost without hope; but I have seen a case which proves that this view is erroneous. So far as I have been able to gather,

* Op. cit., p. 398. † Traité, ant. cit., p. 282.
‡ Du Pronostic, &c., ant. cit., p. 515.
§ Des Maladies Mentales, Tome II., p. 301.
‖ Op. ant. cit.

the nature of the exciting cause has not exerted any influence upon the prognosis, except in the following general manner, viz. that those cases have appeared the least tractable in which the origin of the malady was involved in the greatest mystery; and this, most obviously, because the knowledge or suspicion of cause, in other cases, placed in my hands some power to prevent, avert, or diminish the recurrence of its operation; a power, of course, wanting in the former group.

The *age* at which the disease commences affects the prognosis considerably. There is a general concurrence in the opinion that early development of the malady is of favourable omen. Hippocrates said if the disease commenced after twenty-five it was incurable. Tissot* and Esquirol† speak of the prognosis as good when the disease has shown itself between four and ten years of age, or at twelve. Peters says youth is favourable to a cure.‡ Herpin says the prognosis is best at an advanced age, but next best when it is between ten and twenty years.§ In my own practice, those patients which recovered were, at the time of the fits ceasing, between the ages of fifteen and thirty-two; and the disease had commenced at the ages of from thirteen to thirty-one. The mean age at commencement of eight cases of recovery was nineteen years; the mean age at the date of cure was twenty-one; and from this the important fact is gathered that the mean duration of the malady was but two years.

Sex.—Men are more easily cured than women, said Scribonius: Herpin's opinion is that the reverse is true. In regard of my own experience, the former statement is correct.

Duration.—Romberg says, "Every year the resistance to recovery increases;"‖ and on this point there would appear to be unanimity of opinion. Herpin states that under three months' duration of the attacks the chances of success are great;¶ but it may be questioned whether, in some cases, the diagnosis of epilepsy could be established during this time.

Time of the attacks.—Long intervals are of evil omen,** in the

* Œuvres, Tome VII., p. 215.
† Op. cit., p. 316.
‡ De Epilepsia, p. 12.
§ Op. cit., p. 517.
‖ Manual, Vol. II., p. 217.
¶ Op. cit., p. 524.
** Millar, De Epilepsia, p. 21.

opinion of some; but of doubtful influence, according to others. Repeated paroxysms are "très dangereuses."* Nocturnal attacks are more rebellious than diurnal, according to Delasiauve.† There is no difference to be observed on this score, according to Herpin;‡ whereas Dr. Watson says it is a "good prognostic sign," when fits, having occurred during the day, begin to limit themselves to the night;§ and in this opinion I fully concur.

Mental condition of the patient.—Hasse says, "Bildet sich während der Zwischen-zeiten eine psychische Störung deutlicher aus, und tritt ein körperlicher und geistiger Verfall ein, so bleibt die Krankheit unheilbar."‖ Esquirol states that "l'épilepsie compliquée d'aliénation mentale ne guérit jamais;"¶ yet, in spite of these great authorities, I must say that their proposition is incorrect. I have known such cases to recover perfectly.

General health.—Herpin says that it is a good sign when the general conformation and complexion are good, and *vice versâ;*** but, so far as I have seen, these conditions have nothing to do with the prognosis of epilepsy.

II. Prognosis in regard of the mental condition of epilepties is next in importance to that of the disease as a whole. For information on this point we may refer to Chapter IV., Natural History.†† From this it appears—

1. That the presence of *hereditary* taint or predisposition is without definite influence upon the mental chances of epilepties.

2. That the female *sex* is an unfavourable condition.‡‡

3. That *commencement* of the disease after childhood and after puberty is also of unfavourable omen; that late rather than early commencement is a predisponent to intellectual failure; that this is true of each sex separately and of them both together when the patients are divided at either the tenth, sixteenth, or twentieth year.

4. That the *duration* of the disease is of questionable influence;

* Delasiauve, op. cit., p. 298.
† Traité, ant. cit., p. 298.
‡ Op. cit., p. 526.
§ Lectures, Vol. I., p. 629.
‖ Virchow's Handbuch, p. 276.
¶ Traité, ant. cit., p. 317.
** Op. cit., p. 516.
†† *Vide* ant., p. 162.
‡‡ See Chap. III., p. 46.

but that the preservation of mental integrity even for a short time after the outbreak of the attacks affords strong probability that the intellectual powers may be retained. When the mind has suffered much it has, as a rule, suffered early; and hence the inference just stated.

5. That the mental state is not to be calculated from the presence or absence of those interparoxysmal phenomena which show the existence of disturbance in the centre of *motility*.

6. That the *general* health does not determine the existence or degree of intellectual impairment; but that the latter is more commonly associated with a vigorous condition of the former than with the reverse.

7. That the inference to be drawn from the *number of attacks* is similar to that from the duration of the disease, viz. that it is without direct value, but that from the fact of intellect being preserved after several seizures have occurred affords hope that it may be continued notwithstanding their repetition.

8. That a rapid rate of occurrence of attacks, or high rate of *frequency*, is of unfavourable omen.

9. That the *severity* of the convulsive paroxysm is without definite influence upon the mental chances.

10. That the *character* of the attack is of considerable importance, viz. that "le petit mal" is more prejudicial than "le haut mal."

III. The danger to life of the attacks appears, according to Schroeder van der Kolk, to be represented to some degree by the absence of bitten tongue;* inasmuch as in those cases where this symptom did not occur capillary dilatation was found specially developed in the course of the vagus, and thus the respiratory functions were most seriously involved.

The danger to life, however, in the epileptic is a somewhat remote contingency. It rarely happens that the fits have proved directly fatal. Instances are to be found of death from cardiac disease,† and from cerebral complication; and I have known a case in which a pauper was said to have died in an attack, but the real cause of asphyxial convulsions and of death

* On the Minute Structure and Functions, &c. Syd. Soc. Trans., p. 252.

† See Cases X. and XII., pp. 230 and 232.

in whose case was discovered, *post mortem*, to be a piece of meat sticking in the rima glottidis.

Again, so far as my own observation extends, the attacks rarely leave behind them, in true epilepsy, either paralysis or other change of motility; and still less frequent are any notable injuries to the organs, or functions of special sense.

CHAPTER VIII.

TREATMENT.

"Take the powder of Osmond, and the root of Peony, and the powder of Moztegan, and drinke all these with stale ale, and let them say their prayers; and as soon as the Party falleth downe, and give the sicke to drinke with good ale that is stale, and by God's grace he shall never have the falling evill any more: proved."—LEUENS.

PERHAPS no disease has been treated with more perfect empiricism on the one hand, or more rigid rationalism on the other, than has epilepsy. Unfortunately both methods have often and completely failed; the former, as it must do in a certain proportion of the cases; the latter in a still larger number, because the theories upon which it has rested have often been abundantly wrong.

The most eminent of practitioners have recognised that the real desideratum was a scientific basis for the therapeutics of epilepsy, but the attempt to lay this foundation they have acknowledged to be a grievous failure. "Methodus generalis præscribi non potest in curatione epilepsiæ," said Serda:* "Ratio longe plus fecit, quam medicina ad mitigandum hoc herculeum malum," was the conclusion of Heberden:† yet still, in spite of all attempts, it is found, as expressed in the words of the former, that "epilepsia morbus est gravis, curatu difficilis, omnem enim artis opem haudraro eludit."‡

Esquirol tried all sorts of plans and medicines in the following manner:—Every spring and autumn during ten years, he selected thirty cases of which he knew the history; he inspired hope,

* Tentamen, Med. de Epilepsiâ, p. 7.
† Commentaria de Morborum Historia, &c., p. 121.
‡ Op. cit., p. 6.

and had every facility and assistance in carrying out his plans. Yet the following is his conclusion:—"Toujours une nouvelle médication suspendait les accès pendant quinze jours; chez les unes pendant un mois; deux mois chez d'autres, et même pendant trois mois. Après ce terme les accès reparaissent successivement chez toutes nos femmes je n'ai pu obtenir de guérison."* It must be remembered, however, that Esquirol's cases were all women, in whom the disease is more difficult to cure than in the male sex;† and further, that in all of them there was more or less mental insanity.

Dr. Watson, one of our greatest practical authorities, states that epilepsy is "often recovered from altogether;"‡ and in this less gloomy view of the disease the majority of physicians of the present day would concur. The treatment of epilepsy is not a fond delusion, therefore, and I purpose to detail that which we may regard as established in its therapeutics; and if the value of some agents is exposed to considerable question, the reason for their mention here is, that with so fearful and obstinate a malady, every aid that has any facts to support its claim to that title, is of some importance to the practitioner. "Now nothing must be omitted," said Aretæus, "nor anything unnecessarily done; and more especially we must administer everything which will do the slightest good, or even that will do no harm."§

The treatment of epilepsy will be considered in the following order:—*first*, that of the epileptic condition, including the attempt to diminish undue reflex excitability, and to improve or maintain unimpaired the mental powers and the general health. And, *secondly*, the treatment of the attacks; viz. their prevention or diminution, and the limitation of their severity when they occur.

I. Treatment of the epileptic condition.

1. The *reduction of undue excitability* in the reflex centre has been attempted in various ways, viz. by the administration of sedative medicines, the establishment of counter-irritation, and the maintenance of a certain regimen.

* Des Maladies Mentales, Tome I., p. 319. † See p. 314.

‡ Lectures, Vol. I., p. 624.

§ Extant Works, Syd. Soc. Trans., p. 471.

The *sedatives* which have been used, at some time or another, include the whole materia medica. Some have deservedly fallen into disrepute, others have maintained their ground.

Opium was spoken well of by Morgagni;* by Fraser,† who states that it may "entirely prevent the paroxysm, or mitigate its violence," and that from twenty to forty drops of laudanum may be given "safely with the greatest benefit:" and Dr. Sieveking alludes to a case in which a dose of morphia "arrested a most violent series of attacks."‡ There is no doubt that opium possesses this property, of putting off the attacks for a time—a property common to many drugs,—but the evidence of its permanent utility is defective.

Conium has lately appeared of temporary good service, in many cases delaying the attacks, and diminishing their severity.

Hyoscyamus, belladonna, and stramonium I have frequently employed, and have found from each of them a diminution in the number of attacks. The first of these was given, in combination with oxide of zinc, almost invariably by Herpin in the cases detailed in his book;§ it was also combined in the same manner by Maissonneuve,‖ so that it is difficult to state how much in those cases of amelioration or cure was due to the zinc, and how much to the hyoscyamus. I have tried the combination, and have given both separately, and have found the value of henbane to be that which I have stated, and also the furnishing of definite relief to feelings of nervous discomfort and tremulousness, which are common in epilepties, and are often accompanied by disturbed sleep, nightmare, and starting. After taking either of the three drugs, patients have often expressed their "feeling" of relief; but from no one of them have I witnessed anything that might be called permanent cure.

Atropine and the valerianate of atropine have been used much of late, and there appears considerable evidence in favour of the employment of this alkaloid. Angelo Volonterio, Crosio,

* Cooke's Edition, Vol. I., Lib. ix. 7, p. 109.
† On Epilepsy, and the Use of the Viscus Quercinus, p. 17.
‡ On Epilepsy and Epileptiform Seizures, p. 196.
§ Du Pronostic, &c., ant. cit.
‖ Recherches et Observations.

Michéa, Azario, Lango, all quoted in Schmidt's Jahrbücher at different periods, detail cases of cure. I have had no experience of its employment.

Indian hemp I have administered in many cases, and with the effect of delaying the paroxysms and mitigating their severity in some individuals. Thus in one case an habitual series of seventeen severe attacks was reduced to three of slight severity;* in other cases the intervals have been prolonged; whereas in a still larger number I have obtained no beneficial result. The dose given has varied from one-third of a grain to one grain of the alcoholic extract, prepared by Squire, three or four times daily. In several cases of convulsions, from either eccentric irritation, such as gonorrhœa, &c., or cerebral congestion, I have seen not only marked improvement, but permanent relief.†

Selinum palustre has lately been advocated strongly by Herpin, who has detailed cases of cure;‡ but as yet I have had no experience of its utility.

Quercus viscinus was at one time in great repute. It was advocated by Tatai;§ but Andrée says of it and other drugs, "I have tried them formerly so often till I found that no dependence was to be made upon them only, but that the chief of the cure consisted in circumstances and medicines corroborating the primæ viæ."‖ There were, however, eleven cases carefully recorded by Fraser,¶ and of these nine were cured, after periods of duration which proved that the malady must have resisted many other medicines; and such is the faithful nature of these reports that the medicine appears to me to deserve a renewed trial.

Cotyledon umbilicus I have used frequently, but have found it utterly without effect of any kind that I could recognise.

The mode of action of some gums and resins may be doubtful, but their utility is unquestioned.

* Beale's Archives of Medicine, 1861.

† *Vide* Case IX., p. 212; and On some Therapeutical Uses of Indian Hemp, in Beale's Archives, 1861.

‡ Bull. de Thér., May, 1859, quoted in Schmidt's Jahrbücher, 1859. Bd. 104, p. 304.

§ Hercules vere cognitus, p. 123. ‖ Cases of the Epilepsy, &c., p. 260.

¶ On Epilepsy and the Use of the Viscus Quercinus, p. 89.

Of castoreum I have no experience; whereas assafœtida in large doses, viz. gr. x. to gr. xxx. thrice daily, I have given repeatedly, and have found its effects somewhat similar to those of hyoscyamus. It has relieved certain uneasy sensations; it has delayed the attacks; but it has not cured the disease.

Turpentine was spoken well of by Foville,* and by Dr. Watson.† It has lately been strongly advocated by Dr. Radcliffe.‡ The last-mentioned author has also found naphtha of great value.§

Chloroform appears to delay the attacks for a time, but to exert no permanently good influence. I have given it a thorough trial in several cases, one of which I insert in illustration of its effects.

Case XV.—*Male, æt.* 15: *no hereditary predisposition; attacks commenced in infancy, and continued; frequency variable; no epilepsia mitior; time since first attack, thirteen and a half years; mind almost completely unimpaired; motility slightly disturbed; organic health good; treatment without effect.*

§ I. E. F. Male, æt. 15 in September.

§ II. A. Born in the country, and has resided in a healthy country district, and under extremely careful parental and medical management until the present time.

B. Attacks commenced when eighteen months of age, but for some time they were scarcely noticed, consisting merely of a slight scream. With this exception, infantile and subsequent health has been extremely good.

D. No hereditary tendency discoverable; parents both living, and in robust health; has many brothers and sisters, all of whom are healthy.

§ III. A. Could not account for onset of seizures; but since first commencement until now:—

C. Attacks have increased in severity; their frequency and period of return being subject to great variation, as will be seen hereafter.

* Dict. de Méd. et de Chir., art. "Épilepsie," p. 427.

† Lectures, Vol. I., p. 662.

‡ Epilepsy, and other Convulsive Affections, p. 197.

§ Epileptic and other Convulsive Affections of the Nervous System, p. 164.

September 5th.—§ IV. A. Tall and thin, but of healthy appearance, and bright, intelligent expression.

§ V. The patient was brought to my house for the especial purpose of trying the effect of chloroform inhalation, as it was stated that every kind of treatment—allopathic, homœopathic, hydropathic; and every kind of poison—mineral, animal, and vegetable—had been tried, tried fully, and without effect.

At 1 P.M., just after taking lunch, and being at the time slightly "nervous" from the apprehension of taking chloroform, he exclaimed, "I am going to have one of my attacks," and immediately there followed a noise as of retching, and a general tetanoid spasm. During this spasm, the body, and still more the head, appeared straining towards the right side; and the eyes were turned still further on that side; as if a violent effort were being made to get round to, and see something very much to the right of him. At the same moment the respiration ceased, the face became discoloured, and the pupils dilated. This was followed in a few seconds by champing of the jaws, oscillation of the eyeballs, and apparent attempts to jerk himself from off the chair on which he was sitting; a little saliva came from the mouth; he rose up; but staggered back to a chair; answered to his name, said he was better, and walked up the stairs. The whole attack did not last for longer than a minute and a half.

Chloroform was inhaled slowly at twenty minutes to two, and in a very short time consciousness was lost. The inhalation was discontinued, and he was left to sleep. This he did for thirty-five minutes; and, when he awoke, said he felt "quite well."

September 9th.—Slight attack, in the morning, directly after breakfast.

12*th.*—Chloroform inhaled in afternoon; slept two hours.

13*th.*—Attack at 7 A.M.; another at 10 A.M.; slight.

16*th.*—Chloroform inhaled at 4·30 P.M.

19*th.*— „ „

21*st.*— „ „

23*rd.*— „ „

No attack for ten days until to-day, when one occurred in middle of dinner, 6·30 P.M. This lasted for some minutes; but

after he had recovered consciousness, he rose and finished his meal; and subsequently lay down on the sofa, appearing quite well.

At 9 P.M. he took tea, and very soon afterwards had a second attack, lasting longer than the first. He then slept on the sofa until nearly eleven o'clock, when he went to bed, feeling pretty well.

September 24th.—At 2 A.M. a violent seizure; another at 7; and a third at 9 o'clock, the third being more violent and more prolonged than either of the others. After these there was much exhaustion, frontal cephalalgia, and pallor.

At 11·30 A.M. chloroform was inhaled; he slept until nearly 1 P.M., and then awoke, much refreshed; took some beer, and went into the country. His mother subsequently informed me that she had never, until that time, seen him so much exhausted by the attacks.

September 26th.—Returned to London, appearing as well as usual.

Chloroform to be inhaled daily.

September 30th.—Has inhaled as an average f. ʒiiss. of chloroform daily; and has slept, generally, for two hours after the inhalation. Did so this afternoon, and went to bed at usual time, in remarkably good health and spirits. Spirits were rather higher than usual; but still there was nothing that could with justice be called morbid excitability.

October 1st.—At 2 A.M. an attack occurred during sleep; it was slight, and he did not wake. I administered chloroform in small quantity. At 7 A.M. he awoke, spontaneously, and was not aware that he had had either fit or chloroform in the night. Chloroform was now administered until stertor commenced, and E. F. slept until 8·30. He now rose, and while dressing, an attack came on. It was more severe than that in the night, but not much so. Chloroform was inhaled again; but a third fit occurred at 11 o'clock. This attack was slighter than the last. After another inhalation he slept until 1 o'clock; then rose, appearing tolerably well, took his lunch, and went out, with his nurse, for a walk. A fourth attack came on in Piccadilly, which his attendant represented as more severe than the

third, but still of no great duration; and in the evening, after dinner, he appeared pretty well.

October 4th.—Has had chloroform once every evening, followed by an average sleep of two hours. There has been no attack since the first of the month, and he is now in his ordinary condition. On this day, the following notes were taken.

During the intervals of attack it would not be easy to say in what particular E. F. is out of health.

Mental condition. — Remembering that he is only fifteen years of age, he appears intellectually quite equal to the average. He is manly (for his age) in height, manners, and general appearance. At times there is an apparent "silliness" in his deportment; a childishness, which though not inconsistent with his years, yet appears inconsistent with his general bearing and development, which are certainly beyond his years.

His power of apprehension is by no means deficient; neither is that of attention; but prolonged attention, or much concentration of thought, is rarely seen, and difficult to obtain. He does not appear to follow an argument clearly; but he is just fifteen years of age! For words his memory is defective, but for events is not. He is very much alive to all that is going on about him; is very active, and constantly engaged in one thing or another. He plays chess very fairly; reads a good deal; interests himself in athletic exercises and games; is much taken up with parts of *Bell's Life in London*, and knows well the merits of sundry cricketers, boatmen, horses, &c. &c. At times, however, he seems to amuse himself with a merely childish toy; and this is the more striking on account of his manly bearing. He is restless, and at times (especially on the days of attack) nervous, *i. e.* timid, and easily startled, jumping at sudden noises, shy, and tremulous. At other times this is not the case; and he is at all times amiable, obliging, and of rather winning, attractive behaviour. Wakes early in the morning habitually.

Sensation.—Appears to be in every respect natural. His pupils are of medium size; his hearing very good. He is musical, and plays the pianoforte very fairly, easily catching a tune by ear, and rarely making a discord.

Motility.—Neither clonic spasm nor tremor. Occasionally his respiration becomes suddenly audible, almost stertorous, and continues so for a few minutes or longer. This occurs when he is sitting reading, or doing anything else; generally, however, when his mind is much engaged. He yawns frequently; and not rarely has the hiccups.

Locomotion.—There is certainly either a want, or perversion of the faculty for co-ordinating movements. Thus, in walking, it appears as if he threw his feet upon the ground at haphazard, rather than as if he put them there; and this with a somewhat limping movement, and semicircular throwing outwards of his knees. There is a similar kind of awkwardness about his movement of the arms, for *e. g.* in shaking hands he lifts his elbow outwards and upwards, and then seems to throw his hand at the one offered him. He can run nimbly; and do some things cleverly, *e.g.* fingering the keys of the piano. But he appears by no means clever in other things; *e. g.* he tried times without number to flip a card from under a coin balanced upon the tip of the finger, but I never saw him succeed.

Organic health.—Muscular strength and development are very good. The colour of his hands is natural; and has not the least inclination to blueness. His face is somewhat leaden in tint, especially after the attacks. His appetite is fair; digestion good; bowels regular; and there appears, in fact, nothing the matter with him.

Effects of chloroform.—As volition and consciousness disappear, the ears become of bright but deep-red colour, just like that of the lips; and the pupil of the eye contracts almost to a point. (This I have observed every time that chloroform has been inhaled.) When first feeling the effect of the chloroform, his sensation is that of "deadness of the limbs;" stertor is very soon induced; there are no involuntary startings of the extremities, but there is occasional slight quivering of the facial muscles. The pulse varies from seventeen to twenty-two beats in the quarter-minute; the respirations are from four to five in the same time; and both are regular in rhythm. The superficial pulses become visible. Habitually the sleep from chloroform lasts for two hours; but during the greater part of this time he is only sleeping lightly, and can be instantly aroused.

Attacks.—These differ in severity, but are always attacks of epilepsia gravior; *i. e.* there is always the combination of entire loss of consciousness, with muscular contraction, both tonic and clonic.

Generally, and invariably when awake, there are some premonitory sensations, lasting from two or three seconds to half a minute. There is sometimes a sufficient duration of these sensations for him to say "one of my attacks," or "I am going to be ill," or sometimes only to utter my name. He has not, at this time, lost his power of locomotion; for he can get up from his chair and take another, or place himself on the sofa, or on the floor. He cannot and never could describe the sensation; nor, indeed, can he say where it is, even to decide whether it is in the head, chest, or abdomen; but my impression is that the sensation is more commonly at the epigastrium or cardiac region than elsewhere. It is something of which he has a great horror.

During the premonitory sensation the expression of countenance is as if beginning to cry, or is simply of an imploring character; and if sitting he usually bends forward; and there is some fixedness of the eye, with commencing dilatation of the pupil, and very feeble pulse. Several times this "look" has passed away for a few moments, as I have taken his hand and tried to avert his thoughts; but never, except in the instance to be hereafter described, has the attack been prevented from taking place.

Although the radial pulse is feeble, the heart beats naturally; but there is heaving at the chest, without any cessation of respiration. The fit, as I have said, never passes off; but either continuously, or, under the circumstances mentioned, with slight interruption, it progresses, and the following phenomena occur simultaneously:—Dilatation of the pupil, and very slight jerking movements of the eyeball to the right side; distortion of the features, the mouth being drawn downwards on the left side, and upwards on the right; the neck swells; the muscles are all rigid; and the head is drawn to the right side, with elevation of the chin; the arms and legs are semi-extended, and rigid; the face darkens from the first moment; the pulse becomes feebler, and is lost at the wrist;

there is sometimes a loud, long, gurgling, yelling, or retching sound; and after this, or without it, respiratory movements cease; the heart's pulsations are evident, and rather increased in force.

This stage lasts from four to eight seconds; and then a little clear (not foamy) fluid escapes from the mouth, and universal clonic spasm commences. Pupils are still dilated; the features are pulled in all directions; the arms and legs, as well as the neck muscles, jerk violently; there is the gurgling of fluid in the throat; the respiratory movements are laboured; the heart's action is violent; and the face loses its purple colour, and becomes dark and leaden, or simply pale.

This stage varies much in duration, from two or four seconds to thirty or forty, and on one occasion it lasted much longer.

The movements now assume a somewhat volitional character; but volition is evidently disturbed. He catches at objects; makes grumbling, half-articulate, and sometimes very loud noises; he looks at bystanders with aspect of frowning and distrust, the expression being, sometimes, that of revenge. He throws himself about; and, if spoken to, evidently hears, recognises voice, and appears somewhat calmed.

The violence and duration of this stage are subject to great variation. Once or twice, when he has fallen on the ground, he has jumped up quickly, as if annoyed at finding himself there; has made attempts to speak, but has failed in articulating, and has appeared confused. Sometimes, without arousing thoroughly, he will pass into stupor, with gurgling in the throat. More frequently he yawns several times, sighs, and if the fit has not been severe, goes on with what he was doing before it commenced.

Soon after an attack he passes urine freely, of pale colour; and on "fitty days" passes it very frequently. After having had several attacks he complains of headache, but never on other occasions; he is nervous and easily startled. He says that if he sleeps after an attack he feels much more timid than when he does not. (This is, probably, due to the greater severity of those attacks which necessitate sleep, and not to the fact of sleeping. [?]) Immediately after an attack there is usually rumbling of flatus in the abdomen; and this occurs also during the stage of clonic contraction. I could detect no enlargement of

the spleen. There is no odaxismus; and, as a rule, no real stupor, with stertor. It is again emphatically stated, in my notes, that the "darkness of face is from the very commencement."

October 5th.—Has had no attack for some days, and has continued inhaling chloroform daily. This morning, at 12 o'clock, appeared in good spirits, and was talking to me, when he suddenly exclaimed, "I am going to be ill;" the face was slightly distorted, the pupils dilated, and there was his inexpressible look of distress and alarm. Some chloroform being at my side, I instantly threw some on a handkerchief and held it to his mouth and nose. He was just able to gasp at it; and in a moment the distortion of face, together with its peculiar expression, disappeared, the pupil contracted, and he said, "All right! Have I been ill?" Upon my saying "No," he looked quite contented. I helped him to reach the sofa, gave him a little more chloroform, and he slept for two hours. After this sleep, he rose, took his lunch, and appeared quite well.

Chloroform was inhaled on the next day; and he subsequently told me that he was sure that an attack would have occurred on the 5th, had it not been for the chloroform; for he never felt as he had done that day without having had a fit.

October 8th.—No chloroform inhalation since the 6th. On this day has had four attacks, at intervals of two and a half to three and a half hours. "Slept" for some two hours after each attack, and this with considerable stertor. Appeared very ill afterwards.

October 21st (Report in letter from mother).—Has had no attack since the 8th, but for the last four or five days has been threatening. His face is now "brassy in colour," with dark lines around the mouth and below the eyes. He has become irritable and taciturn. It was agreed between Dr. Walshe and myself that, as it was probable, so soon as an attack took place the usual concatenation of four or five fits would follow, E. F. should be placed under the influence of chloroform, and should be kept under that influence for twelve hours; and E. F. was to come to my house, for that purpose, on the following day.

October 22nd.—When about to start, in the morning, had a severe fit. The "neck swelled so much" that his collar button was torn off. He came to town, but did not sleep in the coach.

At noon, when I saw him, he appeared extremely ill; his face was of a dirty yellowish, leaden hue; his manner was awkward; his eyes staring, and not meeting duly, from slight convergent strabismus.

At 12·30 chloroform was inhaled. At the commencement of inhalation there was peculiar respiration and stertor; the cheeks were drawn in during inspiration, and expiration was performed through the nares with a rhonchal sound, the jaw moving with each respiration. This peculiarity disappeared as the inhalation continued.

At 1·30 and at 3 P.M. chloroform was given in small quantity, and he slept until 3·30. He awoke then, and I gave him some bread-and-butter and ale.

At 4, 5·30, 7, and 8·30, the inhalations were repeated, E. F. being all this time unconscious.

At 10·30 he was allowed to wake, and then looked much better; took some sandwiches and ale, and went to bed very cheerful.

At 10·40 and 11·40 inhalations repeated, and he slept, without stertor, until 5·20 on the morning of 23rd.

October 23rd.—Rose at 7·30 and took breakfast naturally. Chloroform inhaled at 10 A.M. Slept until 11·45, and then waking, vomited his breakfast.

October 24th.—Remarkably well; appetite good; left for the country.

Postscriptum.—Since the foregoing notes were taken E. F. has not been under my care; but upon many occasions I have heard of him, and have not unfrequently seen him. Various plans of treatment have been adopted, but without success; and of late his countenance has assumed more and more of a leaden hue, and his mind has become somewhat enfeebled. During the intervals of attack, however, he sometimes regains his usual cheerfulness and capacity, with the exception of memory, which has become much weakened.

NOTABILIA I.—E. F. affords a good illustration of serial attacks, and of that kind in which the severity of seizures increases from the first of a series to the last. The extreme irregularity of recurrence is seen in the following days of attack:—September 8th, 9th, 13th, 23rd, 24th; October 1st,

5th, 8th, 22nd. During the 44 days that he was in my house there were 19 attacks, or a mean absolute frequency of 1 seizure to 2·3 days; but such was the distribution of these 19 fits that of the 44 days there were only 9 on which attacks had taken place; so that the mean frequency of recurrence was 1 attack, or series of attacks, in 4·8 days.

If we divide the 44 days into periods of seven weeks, we find the following prevalence of attacks:—

In the first week, 4 attacks.
„ second „ 0 „
„ third „ 5 „
„ fourth „ 5 „
„ fifth „ 4 „
„ sixth „ 0 „
„ seventh „ 1 „

From this it is evident that to give any general expression to the period of recurrence, or to the rate of frequency, is impossible.

The actual days of occurrence, the number of attacks, and the rate of frequency may be seen in the following table, in which the forty-four days are divided into seven weekly periods:—

Weekly periods.	Number of attacks.	Actual days of recurrence.	Number of fits.
From September 7 to 14	4	September 8	1
		„ 9	1
		„ 13	2
From September 14 to 21	0		
From September 21 to 28	5	„ 23	2
		„ 24	3
From Sept. 28 to October 5	5	October 1	4
		„ 5	1
From October 5 to 12	4	„ 8	4
From October 12 to 19	0		
From October 19 to 26	1	„ 22	1

II. The occasional stertor of respiration is a fact of interest: I have observed it in other cases, not only of epilepsy, but of hysteria.

III. The effect of chloroform in inducing temporary paralysis of the cervical sympathetic, as shown by the hyperæmia of the ear and the contraction of the iris. The unconsciousness so induced differs diametrically, in its physical causative conditions, from that occurring in the fit. As the attack passed away under the influence of chloroform, the pupil contracted.

IV. Yet there was in the fit, even at its very commencement, neither pallor nor hyperæmia, but duskiness or darkness. I find it stated in my notes taken at the time, that this darkening of the face is too instantaneous, and too early in its appearance, to be occasioned by arrest of respiration. In fact, the face darkens before respiration has ceased.

V. The feebleness of the radial pulse and the violence of the heart's action.

VI. The effect of chloroform appears to have been advantageous only just so long as the nervous system was under its immediate influence. I do not think that a fit would occur in E. F. so long as he was under that influence; but that it was of transient duration only there is abundant evidence to prove, for the attacks came on, in several instances, very shortly after he had awaked from the sleep which the chloroform had induced. If, therefore, chloroform exerted any protecting power, it did this only when in such force as to suspend consciousness.

Bromide of potassium was strongly recommended by Sir Charles Locock* in those cases of epilepsy where the attacks recurred only at the menstrual periods. Such cases are not of frequent occurrence; although it is common enough to meet with women whose fits are more numerous during or just before the catamenial discharge. In the latter class I have tried bromide of potassium, and carried it on until the menses have ceased, but have witnessed no diminution of the attacks. There is evidence to show that this medicine will distinctly diminish erotic tendences in some cases, and especially in the female sex; whereas there are other cases in which it as distinctly fails: but I have administered the medicine many times to males whose

* *Lancet*, May 20, 1857, Vol. I., p. 528.

libidinous propensities were extreme, and whose practices were bad, but it has produced no appreciable result. It has appeared to me of much use in some cases of hysteria, but since Sir C. Locock's suggestion appeared I have not encountered a single case in which epileptic seizures were absolutely limited to the menstrual period.

Oxide of zinc, by some regarded as exerting a specific influence, belongs rather, I think, to the class of sedatives. Notwithstanding the fashionable repute which this medicine has of late years re-enjoyed, its real character was accurately described before its restoration to favour. "In recenti et leviori malo aliquando prosunt (flores zinci) sed in inveterata epilepsia parum valent."* According to Herpin's own account of it† but little value can be attached to its employment. Fraser,‡ Radcliffe,§ and many others speak of it as useless. Dr. Radcliffe treated nine cases, according to Herpin's plan, but it failed in each of them.

Notwithstanding these unfavourable opinions, I believe that it is a valuable medicine, not for the cure of epilepsy, but for the relief or removal of some of its complications. I have administered it to a large number of individuals, and with results which may be summed up thus:—One case‖ was cured; many were generally improved for a time; a larger number could recognise no effect from the medicine. The cases in which I witnessed the most improvement were those in which vertiginous sensations were frequent, and in which there was a restless mental condition, with more or less troublesome insomnia.

Of the ammonio-sulphate of copper, and of nitrate of silver, I know nothing by actual experience, except to the effect that I have met with many cases in which both had been previously given without relieving the malady, and that evidences of the silver were to be seen in the faces of patients still suffering as much as ever from their attacks. The case rendered notable by castration by Mr. Holthouse was one of these, and in him the tint of skin was peculiarly well marked.

Counter-irritation has at some periods been largely employed,

* Peters, Diss. de Epilepsia et de Eclampsia, p. 20.
† Du Pronostic, &c.
‡ De Epilepsia, p. 76.
§ Epilepsy, &c., p. 190.
‖ See Case II., p. 52.

with a view to the reduction of undue exeitability. Old records teem with details of its utility.

Accidental burning of the face in an epileptic has been followed by its cure.* The actual cautery to the skull was highly recommended by Rudolph.† Dr. Watson says, "Twice I have seen good effects from the insertion of a seton in the neck, but twenty times that measure has disappointed my hopes."‡ Of late Dr. Brown-Séquard has employed the cautery with good effect. It is, however, rather with a view to destroy the peripheric origin of an aura than for the sake of, by counter-irritation, reducing augmented exeitability, that Dr. Brown-Séquard has recommended its application.

I have never ordered a seton or an issue to be inserted, but I have frequently met with them, still open, in uncured epilepties, and have more frequently seen their scars in those who, deriving no advantage from them, had allowed them to heal over. In cases of chronic meningitis, which have been confounded with epilepsy, both these modes of treatment have proved of service. Repeated blistering I have employed in epilepsy, also frequent sinapisms to the nucha, but I cannot say that these have been followed by any good results.

As to *diet* and *regimen*, no universal rule can be laid down. That which I have found the least harmful is, a generous allowance of nutritious and easily digestible food, without other stimulus than bitter ale. Too great importance cannot, I think, be attached to regularity of hours, not only in regard of the fact of taking food, but in respect of both its quantity and quality. A similar kind of meal should be taken at the same hours daily, and with great punctuality. It is also of importance that the first period of digestion should be over before sleep occurs; hence the last meal at night should be taken from two to three hours before going to bed. The avoidance of all indigestible viands—of which salted meats, pastry, preserved vegetables, and cheese are the types—is of importance, inasmuch as dyspepsia may at any time be the occasion of a particular attack, and it is desirable to remove all sources of irritation.

* Bouygues, Journ. de Toul., Fév. 1852, quoted in Schmidt's Jahrbücher.

† De Ustione Cranii, p. 21.

‡ Lectures, Vol. I., p. 654.

"Duo epileptici ab omni cibo animali abstinuerunt et sanati sunt," said Heberden.* Dr. Cheyne speaks of "total milk and vegetable diet as absolutely necessary for the cure the transgressing it for any long time always bringing the disorder back."† I have known individuals who have had a similar experience; but they are, I believe, exceptional.

Muscular exercise, regularly taken, and carried as far as possible, short of fatigue, has always been of some service in cases which have come under my care. Brown-Séquard's guinea-pigs, when shut up in cages and abundantly fed, had forty or fifty fits in the day; but when allowed their liberty, and another kind of regimen, the convulsive tendency disappeared in a few weeks.‡

The position of the body during sleep is of itself sufficient either to induce or ward off paroxysms. The head should be well raised, and this not by pillows, which keep it hot and thrust it forward, or get displaced and allow it to fall, but by an inclined plane introduced underneath the mattrass or bed, and so arranged that the whole of the upper half of the body is elevated to an angle of forty or forty-five degrees. No pillow is needed at the head, but one placed under the sheet at the glutæal region gives support and prevents the patient from sliding downwards. When attacks are apt to occur at night, their frequency may be almost always much reduced by this simple expedient.

The shower-bath I have never seen productive of any definite good, but often of very distinct harm. Sitz-baths and sponging baths of a few seconds' duration have generally in this, as in many other maladies, been grateful to the sufferers, and of value in increasing the feeling of health, the enjoyment of food, and the capacity for exercise.

Warmth of the extremities is of service to those whose hands and feet are habitually cold, or who suffer from chilblains. It is a mistaken notion to avoid warmth, under the idea that "it is weakening," in such individuals; and no plan is so effectual as putting the feet and hands into hot water before retiring to rest, then clothing them with woollen or worsted stockings and

* Commentarii, &c., p. 128.

† The English Malady, &c., p. 174.

‡ Arch. Gén. de Méd., 1856, Fév.

gloves, and keeping them warm with bottles of hot water. I state these minutiæ because very often only one of them is employed, whereas all three of them are necessary to accomplish the end desired.

As to sexual intercourse, no general rule can be laid down. Aretæus speaks against it; for, says he, "the act itself bears the symptoms (*τὰ σύμβολα*) of the disease."* Pliny, on the other hand, says, "Multa genera morborum primo coitu solvuntur, primoque fœminarum mense. Aut si hoc non contigit longinqua fiunt, maximeque comitiales."† I have known both epileptic men and women in whom the attacks were prone to occur soon after intercourse, although only one case in which the fit so occurred, *i. e.* during the act, as to show that the relation was more than a coincidence. On the other hand, many of both sexes have assured me that neither the occurrence, the frequency, nor severity of their paroxysms was in any way associated with sexual intercourse. Of course, I am not speaking of excesses, the baneful influence of which is undoubted.

2. The second object of treatment is *to improve, or maintain unimpaired, the mental health;* and, towards this end, much that has been already described conduces. Reasons have been already assigned for the belief that the intellectual impairment, so common in epileptics, is not produced simply by the attacks,‡ but that it depends upon a condition associated with frequency of recurrence of seizures,§ and especially with those of "le petit mal." It is, therefore, highly important to endeavour to reduce the number of the latter by all means within our power. Some of these means have already been detailed; others will be in the sequel.

Mental exercise is, I believe, as necessary for the epileptic as for the healthy; but it, like muscular exertion, must not be allowed to fatigue. No more mischievous advice can be given than that which is often uttered in the words, "Let the mind lie fallow; throw away books and all studies, and allow the child

* Περὶ Θεραπείας χρόνων πάθων, βίβλ. Α. κεφ. δ.

† Nat. Hist. XXVIII. 10, p. 3864.

‡ See Chap. IV., Natural History, p. 180; and Chap. V., Pathology, p. 282.

§ See p. 184.

or the adult to be crossed in no way, but to do just as he or she may wish or fancy at the time." By these means the habit of attention, the faculties of memory, and of self-government, and the intellectual powers generally are damaged, and that rapidly and seriously. Instead of this plan there should be regular, disciplined mental effort; and this not only daily, but hourly; of course, duly guarded as to time and intensity, and alternated with relaxation. There should be no "strain," but the patient should have to cultivate by exercise the powers of his mind; should have, for example, to read or hear read a few lines, or as much as can be borne without fatigue, and then to repeat their meaning, or write it down in other words. Thus attention, apprehension, thought, reflection, memory, and reconstruction are all employed; and this may be accomplished in the child by one line of the simplest and most childlike hymn, and in the adult by such kind and amount of either prose or poetry as it may be within his power to follow. Much reading by the patient is, in my opinion, very bad, even if the books read are the easiest of comprehension; for there is, in the act itself, a considerable strain upon the nervous apparatus of vision. This may be much mitigated by large type and a good light, but it is better for the epileptic to read little. Large maps, globes, drawing—not at a table, but at an easel, and at arm's length,—will be found useful adjuncts. It has occurred to me many times to see the good mental effects of training upon those epileptics whose faculties were failing, and I have never witnessed any injurious results.

Emotional excitements of the more violent character should be scrupulously avoided. Operas, theatres, ball-rooms, and the like, are positively pernicious in these cases.

The most desirable object to attain is the finding of some occupation in which the patient takes interest, which requires some concentration of mind, but not much thought, and which may occupy many hours of the day. Drawing and painting, under the conditions mentioned, are of great value; the fabrication of various articles; amusement with a fernery, garden, vivarium, &c., may be also recommended.

3. The *general health* must be maintained by those measures

which are common to many chronic diseases. Simple regulation of the bowels, by Gregory's Powder taken nightly, will in many cases diminish the number of attacks, and even put them off altogether.

Various tonics have had considerable reputation in the treatment of epilepsy; they have failed to do any good in a large number of cases; but the reason for this has been, I believe, wrong diagnosis. It has occurred to me many times to have under my care patients who for years had been treated for epilepsy; who had gone from one physician to another, taking now iron, and now quinine, then zinc, copper, strychnia, or silver, but deriving no benefit from any one of them; yet becoming slowly and steadily not only better, but well under a mild mercurial course, these patients having really suffered from meningitis.

Strychnia I have given to many epileptics, but have invariably failed to find any good result therefrom.

Iron, on the other hand, is of great utility in those persons for whom it would be prescribed on account of the condition of their general health. It is of no use whatever *quoad* epilepsy, in any more direct manner. Small doses continued for a long time have been, in my experience, the most useful. The following case is given in illustration of the utility of iron.

Case XVI.—*Male, æt.* 20. *No hereditary taint; first attack æt.* 19, *from fright; subsequently some doubtful attacks of "le petit mal;" only three severe seizures; mind confused; organic health fair, but pallor considerable; slight evidences of exaggerated motility. No attacks for seven years. Recovery after taking iron and mild aperients.*

§ I. Male, æt. 20, in February, 1852; never brilliant mentally, always pale.

§ II. A. Has lived in London, in easy circumstances.

B. Previous general health good.

D. Father and mother living, æt. 45 and 40; one brother only, æt. 12; no hereditary predisposition to fits or any other disease than he is aware of.

§ III. First attack occurred in October, 1851, from

"fright" at seeing an accident. The second attack was in November, four or five weeks afterwards.

Feb. 7th, 1852.—§ IV. A. He is paler and thinner than he was; he complains of weakness.

K. Mentally he is unaffected; but he has much headache, weight at top of head, and feeling of tightness as if a string was drawn round temples. He was drowsy, and yawning for a day or so before each of the fits, and for ten minutes previously felt a choking sensation. Excessively prostrate after them. In the attack he was very pale; his arms and legs were strongly convulsed. In the first he was unconscious for twenty-five minutes; in the second for an hour and a half. There was no stertor. There are no recognisable changes in motility. No "petit mal."

§ V. F. Has been taking strychniæ acetatis g. $\frac{1}{60}$ three times daily (prescribed by Dr. Marshall Hall) for four months. Ordered to continue taking it.

March 23rd.—§ IV. A. Has had no attack; pale aspect continues.

E. Respirations 16.

F. Pulse 72, firm and full.

K. Vertigo occasionally; slightly deaf.

§ V. E. Habeat ferri carb. cum saccharo, gr. v., ter die.

April 6th.—§ III. No attack, but has had pain in head and "weight across forehead" for three days.

May 11th.—§ III. Free from attacks; but for last three days has felt "giddy," and is said to "turn round, as if lost, and look about vacantly." This has occurred eight or ten times in the day, and he cannot account for it.

§ IV. K. He says that he "seems to lose his mind for a minute or two at a time." He looks very stupid and vacant. His right pupil is a little larger than the left; they both contract well to light of window. No deviation of tongue; no trachelismus, either in appearance or sensation. Does not feel cold or shivering. Starts in sleep at night, or when dozing during day. Arms unsteady. No undue irritability of muscles on percussion.

F. Pulse 64, regular, a little jerking.

E. Respiration 12.

B. Temperature of hands equal, but lower than that of cheeks.

A. Face very pale, with a stupid expression.

May 30th.—§ III. On the night of the 28th had a severe attack. Weather had been very hot, and he felt much fatigued; and took at supper half a pint of ale, a thing he had not done for months. There was no warning of the seizure; it consisted of a number of violent convulsions—some eight or nine—alternating with periods of comparative tranquillity. It lasted altogether two hours. He was very pale throughout.

§ IV. He looks now excessively stupid, and complains of feeling exhausted. He has slight pain across the forehead, and exhibits muscular twitches.

July 28th.—§ IV. Much brighter looking. No attack.

§ V. Ferri C. c. sacch., gr. x., quotidie. Haust. aper. alt. noct.

October 6th.—§ III. No attack.

§ IV. Looks much better in face; cheeks pale, but lips of good colour. Tongue healthy, and bright red. Appetite good. Bowels regular. Mind quite clear; neither jerking nor tremor of hands; can follow occupation, feels strong, suffers from no discomfort of any kind.

Since this time has continued well.

There was some doubt on my mind whether this case was one of simple epilepsy. I have, however, placed it among the eighty-one analysed in this work, because there is no other diagnosis at which I can arrive; and because the age at commencement, the exciting cause of the first attack, and the general features of the seizures, both severe and slight, were those often met with in epilepsy, whereas there was nothing to show the existence of ulterior disease.

Case XVII.—*Female, æt. 24. No hereditary predisposition to epilepsy. Epilepsia mitior commenced æt. 22; epilepsia gravior æt. 24. Attacks always at night. Mind much affected from the first. Relief of symptoms after taking bromide of potassium and Indian hemp.*

§ I. Female, æt. 24 in July, 1860; of considerable imaginative power, and before present illness of great mental activity and robust physical health.

§ II. A. Has lived in the South of Europe until twenty-three years of age. She was the second of nine children. Is now residing in a healthy locality in the neighbourhood of London. Has read much; taken considerable walking exercise; and been exposed to no recognisable cause of disease.

B. She had no infantile convulsions, whereas two of her sisters had. When five years of age, the "liver got out of order;" her evacuations became pale; the glands in the neck swelled, suppurated, and were lanced. She was weak for two or three years afterwards, but had no definite illness. When twenty-two years of age, had pertussis. She has occasionally walked in her sleep, and so have four of her sisters.

C. Catamenia commenced at fourteen years of age; tolerably regular in recurrence. For the last five years, since over-walking herself, she has pain during the first day, at both sacral and pubic regions; not in the inguinal. The discharge is in large black lumps. For a year she had constant leucorrhœa, but it has ceased now.

D. Parents both living; and none of relations on either side have exhibited signs of marked nervous disease or disturbance.

§ III. A. Can attribute present illness solely to over-walking, which was continued daily for some months.

B. At twenty-two years of age she began to suffer from pain in the head, and found that she could not read so well as before. The words on the page seemed to run together, and she could not understand them. Several times every day she lost herself completely; and these attacks recurred for many months. Upon coming to England they ceased, and she felt quite well until she took to hard reading for an examination, and this brought all her troubles back again.

C. In May, 1860, being then just under twenty-four years of age, an attack of epilepsia gravior occurred at night. There was general convulsion, and with this loss of consciousness. A fortnight later a second attack occurred, after considerable mental excitement and muscular fatigue. Three weeks afterwards another fit came on, and this without any assignable

cause. Since this period the attacks have recurred at irregular intervals, for nine months; the longest interval has been five weeks and two days, the shortest twelve days. They have always come on during sleep, between one and six o'clock in the morning; and she is usually sleepy for the whole of the following day.

In addition to these severe seizures she has two or three, or more, attacks of "le petit mal" daily.

Gradually she has fallen into the mental state to be described hereafter. (See IV. K.)

§ IV. A. The patient is a well-nourished person, of good colour, and, when roused, intelligent expression of countenance; but when left to herself, of dull, almost stupid aspect.

B. Hands and feet are almost always cold. She does not suffer from chilblains.

D. Tongue clean; appetite not good of late; is troubled with flatus after food: the bowels are obstinate, and unless she takes medicine, do not act for four or five days. Her diet is simple.

E. At times, before attacks, she breathes audibly, with a peculiar kind of stertor; but she has no feeling of dyspnœa.

F. Pulse moderately full and firm.

I. Catamenia are now in condition described (§ II. C), generally lasting three days, or three and a half, whereas the duration used to be five. The attacks have often come on just after this period; but they are by no means limited to that time, nor is menstruation always either accompanied or followed by them.

K. She is subject to headache at the vertex: it comes on once or twice a week; and any "excitement" will bring it on more frequently. She feels "generally uncomfortable," and out of spirits; she does not "care to think;" is "dreadfully lazy;" and often sits for two or three hours by the fire, "feeling nothing, thinking of nothing, caring for nothing." She is easily frightened; often feels alarmed, "as if some horrible thing were near her;" is depressed in spirits, and very cross. Her memory has failed ever since the first attack: a week after she has read a book she has forgotten all about it. She forgets little things from day to day; and is "not observing," her mother says. Her faculty of apprehension does not appear

impaired when she tries to exercise it; but this she very rarely does. She can think well enough when she tries; but she does not care to try. The head and forehead are well shaped and ample.

There is neither tremor, clonic spasm, nor tonic. Occasionally she starts in sleep, or when just falling asleep, but she does not suffer from nightmare.

M. The pupils are equal and of medium size, *i. e.* their diameter occupying one-third of that of iris and pupil together. She is intensely myopic.

§ V. E. ℞. Potassii bromidi, gr. v.
Spiritus Myristicæ, f. ʒss.
Aquæ destillatæ, f. ʒj.
M. et fiat haustus ter die sumendus.
℞. Extracti cannabis Indicæ, gr. ½.
Pilulæ aloës eum sapone.
Extracti rhei, āā gr. iiss.
Olei crotonis tiglii, gr. ½.
M. et fiat pilula omni nocte sumenda.

February 12th.—§ III. C. An attack occurred on the twelfth day after the preceding fit. Yesterday was the twelfth day after the last seizure; and she feared another, but it did not come on. The last two fits have differed from those preceding them in this respect, that her sister has been unable to rouse her to consciousness until the next morning. She has been at the time of the paroxysm perfectly insensible; but the convulsive movements have been less violent than they were, and she has not bitten the tongue. For two days after the last attack there was severe headache, but she has had none since. The Indian hemp was discontinued for three days, and she did not feel so well; but with the exception of those days there has been great improvement in the feeling of the head.

§ IV. A. Aspect is improved, and general feeling very much so. Can take exercise well.

B. The hands and fingers are warm now; but it is said that "they die" two or three times daily.

D. Appetite bad; no sickness.

I. No catamenia since last report. Leucorrhœa continues.

K. No headache at present. No vertigo, except occasionally after stooping.

§ V. E. Habeat extracti cannabis Indicæ, gr. j. omni nocte.
Pergat in usu aperientis.
℞. Potassii bromidi, ℈j.
Spiritus Myristicæ, f. ʒss.
Aquæ destillatæ, f. ʒiss.
M. et fiat haustus ter die sumendus.

This last medicine to be commenced after the cessation of the next catamenial discharge.

Since this report there has been no return of the attacks, and the patient has improved in every way. The head is now free from pain; there is capacity for occupation of mind and exercise of body. The general health has improved; and, so far as it is possible to judge after so short a period, there is the establishment of perfect health. The Indian hemp pill is still taken at night, but other medicines have been discontinued.

I have given this case in detail because it is one of several which have recently come under my care in which cannabis Indica has appeared to be of greater service than it had been in my previous experience. It is but right, however, to state again that I have given it a thorough trial in other cases without being able to perceive any other effect than a temporary postponement of the attacks.

Resumé of treatment of epilepsy.—The first essential is diagnosis: organic disease of the brain, diathetic disease, and eccentric convulsions must be eliminated carefully: we must know what it is that we have to treat. The next point is to ascertain the actual condition of the patient between the paroxysms; it is simply absurd to order medicines because the case is "epilepsy." Patients may be formed into groups for this purpose. In the *first* of these we place those individuals whose mental faculties and whose general health are unimpaired, and who exhibit no striking alterations of motility. These cases are, so far as I have seen, incomparably the least tractable; and what can be done for them is, comparatively speaking, little. Diet, regimen, and counter-irritation are of more value than

medicine; for in regard of the latter we are more or less shut up to those drugs which are supposed to exert some sort of specific influence, such as oxide of zinc, &c.

In a *second* group I would place those cases the prominent feature of which is mental incapacity; and for their treatment the measures already described will, I think, be found most serviceable.

The *third* class consists of those whose general health is impaired, and who require various kinds of management. If there is anæmia, with cold extremities; generous diet, warmth, stimulants, and iron are the most valuable of our aids. Quinine, or cinchona bark, may be added if there is general feebleness. The digestive and secretive functions, together with the excretions, require the first attention in other cases; whereas in some, uterine derangements necessitate correction. To attend to these points is of more utility than to administer so-called "anti-epileptics."

In a *fourth* group there are evidences of exalted irritability of the nervous centres; and these demand the first attention. The various sedatives, enumerated in the early portion of this chapter, may be given, and with most marked improvement.

II. Treatment of the attacks consists in the endeavour to prevent or arrest their recurrence, where this is possible, and to reduce their severity when it is not.

The possibility of accomplishing the first of these objects is dependent upon the presence of warning sensations or precursors of the paroxysms. When the seizure is quite sudden, little or nothing can be done; but, happily, in many cases* there are a few moments that may be well employed.

If an "aura" is felt, the attacks may be arrested by pressure, ligature, or section of the nerve-trunk; by cauterization of the surface, or by elongation of the muscles. The evidence which Dr. Brown-Séquard has adduced upon this subject is of the greatest value. His views are now familiar to all interested in epilepsy, and I refer the reader to his works† for further information.

* See p. 285.

† Researches on Epilepsy.

In three cases which I have seen the attacks could be prevented by grasping the limb from which the aura arose, so soon as the sensation occurred or a jerking movement commenced. In one of these a simple contrivance, like a large lemon-squeezer, was worn loosely round the arm, and the patient could compress the nerve by grasping the handles. In this way he succeeded in stopping six out of seven fits. In another case, in which a sensation in the heel was followed by drawing up of the leg, the attacks were preventible by forcibly holding down the toe with the heel of the other foot, drawing the body erect, and grasping the thigh. This patient has now been free from attacks for five years. In another case, the parents grasped the jerking hand of their daughter, and thus stopped many paroxysms.

Cauterizing the surface whence the aura came failed in the first of these cases; it was not tried in the others; but Brown-Séquard has proved its utility in some individuals. Cauterization of the larynx, moreover, has been followed by diminution or removal of the attacks, not only in animals,* but in man.†

Ligature and pressure upon the nerve can only palliate the symptoms;‡ but destruction of the periphery may remove the causative conditions and effect a cure. Hence, as Brown-Séquard has suggested, an aura should be sought for even when not felt by the patient; and this may be done by applying to various portions of the skin, heat, ice, galvanism, &c., or by pinching or pricking suspected spots. If suspicion is confirmed, blistering or cauterizing the surface should be resorted to.

Chloroform may arrest an attack, but only for a time;§ ammonia may exert a similar influence.‖ Romberg states that deep inspirations may prevent the outbreak of convulsions.¶ In many cases I have known the attacks to be warded off, and that

* Brown-Séquard, Researches, p. 81.

† Ebenezer Watson on the Topical Medication of the Larynx, p. 158.

‡ "Si morbus ab astu quodam affecto initium sumat, ligatura averti potest paroxysmus, verum non eradicatur causa." (Serda, Tentamen, p. 8.)

§ See Case XV., p. 326.

‖ See Case IX., p. 223; Watson's Lectures, Vol. I., p. 656; Heberden, Commentarii, p. 127.

¶ Manual, ant. cit., Vol. II., p. 224.

for a long period, by the patient carrying in constant readiness, and taking a draught containing twenty grains of bicarbonate of potass, a fluid drachm of sal volatile, or of chloric ether, or of tincture of valerian, and an ounce of camphor mixture. The moral effect of this may aid its operation, but its utility is not to be entirely explained in this way.

Compression of the carotids and vagus appears to curtail the attacks, and sometimes to prevent them. Romberg says he has found it "an effectual prophylactic:"* Cooke speaks well of it, relating cases by Earle:† Van der Kolk alludes to a case of Reimers, mentioned also in Schmidt's Jahrbücher, 1857, where the fit was cut short twenty-two times, the "patient experiencing great relief and improvement in his memory and mental condition."‡

Pressure on the vena cava inferior has also arrested attacks. This Jackson explained by its allowing the blood to flow freely into the auricle from the superior cava.§

Dr. Watson put salt to experimental test, and says, "It certainly did seem to curtail the convulsions. . . . Probably it is more calculated to relieve in an hysteric than an epileptic fit."‖ I have seen it, years ago, crammed by villagers into the mouth of an epileptic, but in that case it certainly produced no beneficial result.

The evidence in favour of tracheotomy is extremely doubtful. In one case, to which I have referred already,¶ it accomplished nothing. In Andrea Verga's case it was useless.** In another case which came under my own notice it was of no avail. Dr. Radcliffe states that in Mr. Cane's case the tube was worn "with its opening carefully corked up;" and that in Mr. Anderson's case, although the tube was still worn, "death happened in a fit."†† In other cases it appears to have been of some service, but it is questionable whether the good effects have not been

* Manual, Vol. II., p. 223.

† History and Method of Cure of the Various Species of Epilepsy, p. 115.

‡ On the Minute Structure and Functions, ant. cit., p. 228.

§ An Inquiry into the Nature and Causes of Epilepsy, p. 72.

‖ Lectures, Vol. I., p. 648.

¶ See p. 268.

** Schmidt's Jahrbücher, 1852, Vol. IV., p. 167.

†† Epilepsy, &c., p. 209.

due to moral impression, to counter-irritation, or to some other obscure mode of operation; it is certain, from the facts already stated, that they cannot be explained by the mere physical fact of an opening into the trachea. If tracheotomy is of any use in epilepsy, it is not by its preventing or undoing the effects of laryngismus.

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